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Editor Second Part.

FIRST PART

- | | | |
|---------------------------------------|-------------------|-----|
| I. THE TERRAIN IN MILITARY OPERATIONS | Lieut. Reed | 1 |
| II. A UNITED STATES ARMY | Lieut. Batchelor | 54 |
| III. RAPID FIRE GUNS | Lieut. Van Deusen | 75 |
| IV. DISCIPLINE AND TACTICS | Captain Harris | 100 |
| V. REMINISCENCES OF TONQUIN | Lieut. Cloth | 114 |
| VI. COMMENT AND CRITICISM | | 122 |
- I. "Magazine and Ammunition in a Sea-coast Fort"—(Parkhurst.) II. "Mounted Infantry"—(Stretch, Wilson, Ray, Clarke.) III. "Battle Tactics"—(Frost.)

SECOND PART

- VII. REPRINTS AND TRANSLATIONS
- | | | |
|---|---------------------------|-----|
| 1. Smokeless Powder (<i>Captain Mock.</i>) | Capt. Mahan | 134 |
| 2. Letters on Infantry, XIII. (<i>Hohenlohe.</i>) | Trans. by Lieut. Gurovits | 143 |
| 3. Service Range-Finding (<i>Aldershot.</i>) | Lieut. Buckle | 151 |
| 4. Infantry Attack | Trans. by Lieut. Dean | 161 |
| 5. Artillery Questions of 1890 | Trans. by Lieut. Bush | 165 |
- VIII. MILITARY NOTES 181
- The Berthier Rifle. Inspection Report on British Cavalry. The Artillery of the Future and the New Powder.
- IX. REVIEWS AND EXCHANGES 189
- The Franco-German War. The Year's Naval Progress. On the Border with Crook. The History of a Regiment.

ANNOUNCEMENTS NEW MEMBERS HISTORICAL SKETCHES

- | | | |
|---|----------------|-----|
| X. THE TENTH REGIMENT OF CAVALRY | [Lieut Bigelow | 215 |
| XI. THE TWENTY-FIFTH REGIMENT OF INFANTRY | Lieut. Andrews | 224 |

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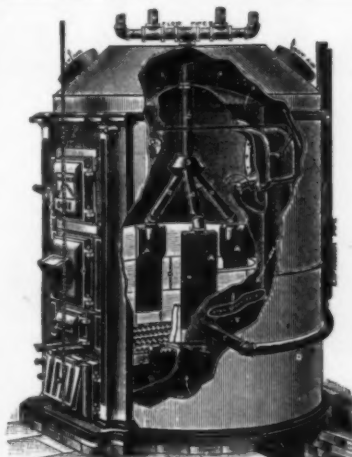
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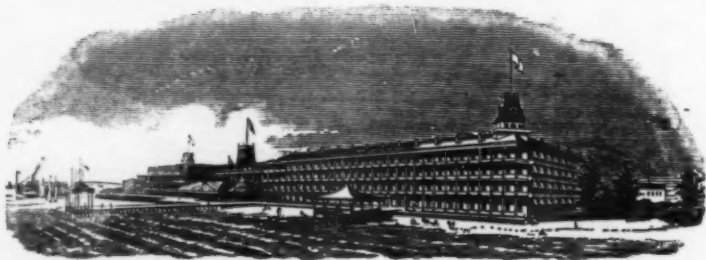
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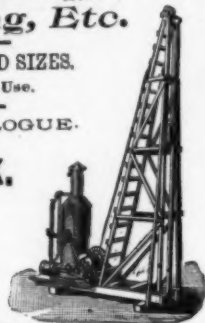
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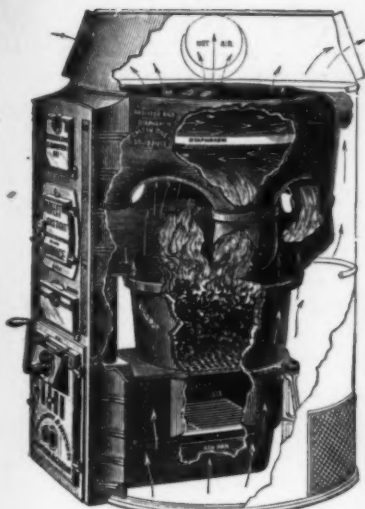
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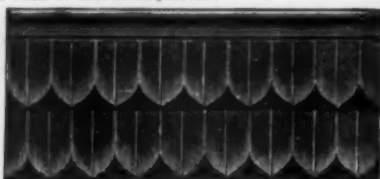
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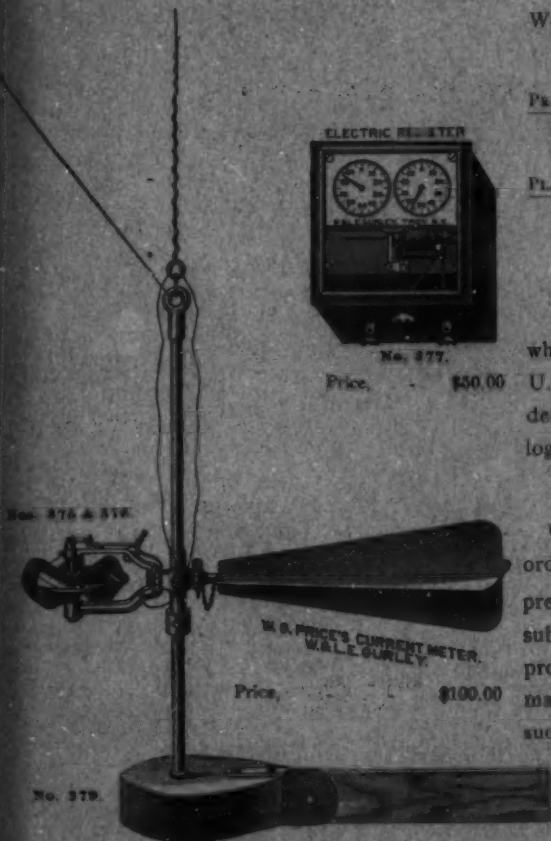


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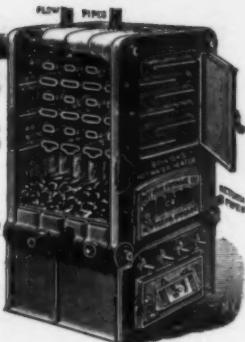
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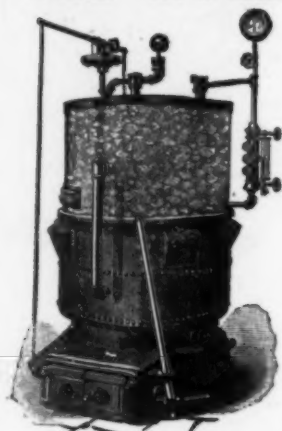
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NO. LV.

Prize Essay.

THE TERRAIN IN ITS RELATIONS TO MILITARY OPERATIONS.

BY LIEUTENANT HENRY A. REED, 2D U. S. ARTILLERY.

BY terrain is understood the ground, its configuration and natural and artificial diversification; the topographical character of the country, region, or tract, as viewed from a military standpoint.

The subject is unusually interesting because, as an element for consideration in most military operations, the terrain possesses a value at least equal to that of either time or distance.

Every theatre of war, field of operations, battle-field, skirmish-line locality and outpost, presents its peculiar topographical features, which may become aids to success in direct proportion to the amount and degree of skill displayed in making use of them. In grand operations; mountain ranges, valleys, deserts, lakes, rivers and forests: in minor operations; hills, ravines, ponds, brooks, marshes, woods, thickets and undulations of the ground, either in their natural condition, or as modified by art; and the more minute features usually encountered on the skirmish line and in outpost duty, are most powerful though silent participants in the various phases of the struggle; and their probable, though often certain influence and effect require most careful study for proper utilization.

For a subject of such importance and wide application, it is impossible, within assigned limits, to attempt to cover the ground with more than a description of salient features; for which purpose and the method and convenience afforded, the following subdivision is adopted:

I. Examples of the Influence and Effect of Terrain on Military Operations.

II. Analysis of Terrain in its Relations to Military Operations.

III. Considerations as to the Necessity for a Knowledge of these Relations.

IV. Remarks upon the Means of Obtaining Information as to the Terrain.

V. Means of Acquiring a Practical Knowledge of the Subject.

EXAMPLES OF THE INFLUENCE AND EFFECT OF TERRAIN ON MILITARY OPERATIONS.

(a) *Theatres of War and Fields of Operations.*

History shows that in a theatre of war possessing a great extent of terrain, it is more difficult to foresee or even calculate the probable outcome of military operations. The occupation and observation of different parts of the theatre frequently require long lines of communications, which, with secondary bases at remote intervals, expose any of the armies so conditioned to unforeseen assaults that may render nugatory the most carefully prepared plan; and the great intervals which at times separate the armies of either side, render it an almost superhuman task to preserve that control and direction necessary to attainment of the common end. But in a narrow theatre, proximity of the contending armies is forced, control is comparatively easy, the struggles are usually fiercer and more frequent, and, as a rule, the conflict is soon ended. The former case is well illustrated in the campaigns of Napoleon and of our Civil War, and the latter by the wars of 1866 and 1870.

A map calculation shows that the actual theatre of the Franco-German war of 1870 included about 50,000 square miles; and that of our War of the Rebellion, nearly 780,000 square miles, or about fifteen times the former area; in fact, the Virginia field of operations alone, to which is added that portion of Maryland and Pennsylvania traversed by the local Union and Confederate armies, closely approximated in extent the Franco-German thea-

tre. At the respective dates, the population of each of these theatres was about 10,000,000; and the numbers engaged in important battles, in several instances, were about the same in the two wars.

The contrast afforded by this comparison of extent of terrain is fairly equalled in degree by that of the main topographical features. In some of our fields of operations and in large parts of others, towns, villages, and often even settlements, were few and far between; and, as a natural consequence, highways or good roads were scarce, and, therefore, in many cases, unavailable for the marches incident to the solution of a suddenly prepared strategical problem, or to a tactical combination. Several of these fields were also traversed by mountain chains and broad rivers, which, next to deserts, are recognized as the most formidable of military obstacles; and open country was the exception.

In the French territory, on the contrary, owing to its dense population, the entire region was under cultivation; towns and villages were separated by but a few miles; excellent connecting roads traversed the country in nearly every direction and at short intervals; and the general configuration of the ground seldom exceeded in harshness the undulating type.

The difference in effect of these conditions on the respective military operations was consequently very pronounced. In the Franco-German theatre the marches were performed with celerity and great uniformity; hence, combinations could be rapidly and accurately effected. As the troops obtained food and shelter, as well as transportation in an emergency, at the bivouacs, from the inhabitants, the march was neither impeded nor encumbered by the enormous camp-equipage and subsistence trains, which the nature of our own country rendered necessary; and the absence of broad rivers dispensed, to a great extent with the use of the cumbersome pontoon equipment, which at times so critically delayed the movements of our armies.

The theatre of the war of 1866,—the belt of territory extending from Hanover to northern Italy, and including these limits,—approximated in extent 100,000 square miles, a little over one eighth of our own theatre. Its natural topographical diversification is similar to our own; but, like the Franco-German theatre, its population, about 33,000,000, was far more dense and its highways and other artificial features were consequently, for like areas, very much more numerous.

Considering the wars of the present century, the foreign theatre which presented an extent of terrain equal to that of our Civil War was the scene of Napoleon's campaigns, during the period in which it included France, the greater part of Spain, the present German empire, Italy, Austria and the invaded portion of Russia. The topography was at least as varied as ours, but with the striking difference, in its relation to strategical movements and the supply of armies, of the absence of steamboat, railroad and telegraphic communication.

In studying the recent wars of Europe and of the Rebellion, there is another marked difference, the proper consideration of which is most apposite to the present subject, and valuable in comparing the respective army movements and dispositions : and this is that, in the European wars, operations were conducted over ground of which minutely accurate topographical maps were usually available ; whereas, in our war, topographical knowledge of the country was so deficient that in some cases,—notably, on the Union side, in the advance up the peninsula toward Yorktown, where even a river was wrongly mapped—entire armies were deflected from their intended direction.

Nor was this lack of knowledge of the terrain confined to the Union armies. The Confederates, strange as it may appear, were likewise, at times, very ignorant of the topographical features, even in cases where a knowledge of them was of vital importance, and plenty of time had been given and the opportunity afforded after the outbreak of the war for its acquisition ; for instance, referring to the battles preceding the withdrawal of the Union army from the Chickahominy to the James, a Confederate general, D. H. Hill, states that " The maps furnished the commanders of the Confederate army were very full in regard to everything within our lines ; but a red line on the east side of the Chickahominy and nearly parallel to it, without any points marked on it, was the only guide to the route on which the march was to be made " ; and another Confederate general, E. M. Law, adds : " Throughout this campaign, owing to ignorance of the country and lack of reconnaissance of the successive battle-fields, the Confederates attacked just when and where the enemy desired. The real trouble was that the Confederate officers, even those in high command, knew little or nothing of the topography of the country in which they were operating. An accurate map in the hands of each division commander would have * * * ensured time

enough to bring the whole Confederate force upon the field of Gaines' Mill several hours before it reached there. If the Union right had been broken at 4 o'clock instead of 6.30 P. M., night would not have intervened to cover the withdrawal of the routed troops, and the right wing of the Union army could have been captured or destroyed in attempting the passage of the Chickahominy. McClellan was a long time in getting from Yorktown to this position, and all his movements indicated the probable position he would take in front of Richmond. There was no lack of time therefore to map the locality accurately, and no lack of warning that it would be of the most vital importance. To undertake the defense of a city, without attempting to learn the topography of the country around it, was a new principle in modern warfare." It is unnecessary to state that the lack of sufficient knowledge of the country, on the part of the Union army during the advance in this campaign, at times seriously interfered with its proper conduct. In fact, it was a general failing in most of the campaigns of the war.

The effect of pronounced types of configuration on grand operations is probably nowhere better illustrated than in Napoleon's campaigns in Spain and Italy, and in those of our Civil War which took place in Virginia, East Tennessee and Georgia. The former are prominent in history and familiar to every military student, while the latter will receive greater attention in this respect as time progresses.

Among the many illustrations from the latter source that could be cited, there is one of which mention is seldom made, and which is alike remarkable as a strategical success and for the important results gained with so little loss. June 23, 1863, the Union army under Rosecrans left Murfreesboro, Tenn., with a fighting force of about 50,000; Bragg, in command of the Confederates, numbering about 45,000, occupied Shelbyville and Tullahoma, respectively 14 and 18 miles southeast of Murfreesboro; and these points had been very strongly fortified during the preceding six months in order to oppose any attempt on Chattanooga, a most important railroad centre and the main objective of previous campaigns of the Union forces in this field of operations. The country between Murfreesboro and Chattanooga presented a variety of natural diversification of the most pronounced types. West of Shelbyville, although wooded, it was fairly level and with good roads; while to the east, the upland region, thickly wooded

and with its narrow and winding country roads, offered continuous obstacles to the advance: moreover, access to this part was to be had only through a few gaps in the intervening foot-hills. The cavalry under Stanley was sent "20 miles west and a little south of Murfreesboro with orders to advance on Shelbyville, June 24, in bold array; and, at night, to fill the country to their rear with camp fires extending from the left of the Confederate General Hardee's position at Shelbyville westward, indicating the presence of a heavy infantry force." This ruse retained Hardee. Wilder's "splendid brigade of mounted infantry," armed with Spencer repeating rifles, moved directly on Tullahoma, passing through Hoovers' Gap at a trot, and drove the enemy's strong pickets and their reserves back upon the infantry division which held a fork of the Elk River, about four miles from Tullahoma. Although this division was reinforced by a brigade, Wilder held his ground until a division of the 14th Corps, which had followed the movement as rapidly as possible, came to his assistance and secured the bridge across the fork; whereupon the Confederates fell back to their main line. The 20th Corps followed the 14th; the 21st was directed towards Bragg's right and rear; while the reserve corps held the ground in front of Murfreesboro. The first two corps mentioned, after a sharp contest for Liberty Gap, then bivouacked within two miles of Tullahoma. Guy's Gap in front of Shelbyville was captured by Stanley, and the occupants were driven back through the town, which was evacuated by Hardee who had then been withdrawn toward Tullahoma. On account of the frightful condition of the roads, the 21st Corps marched but 17 miles in four days, and, when it arrived, line was formed as if to attack Tullahoma, in order to mask a flank movement through the woods to Elk River bridge, four miles in rear of Bragg's position. The force employed for this purpose arrived just in time to witness the crossing of the Tennessee by the rear of the Confederate army.

Tullahoma and Shelbyville were thus gained with very little loss by Rosecrans' brilliant manœuvre. The writer can vividly recall the abattis nearly half a mile in breadth, consisting of felled trees with their outward projecting branches carefully pointed, which covered the glacis at Tullahoma, and the feeling of intense satisfaction expressed that our army had not been called upon to charge these works over such an obstacle and in the face of the murderous fire that would have been brought against us: and

Shelbyville was as strongly protected. As the Confederate commander naturally believed that the Union advance would be over the less difficult country to the west, it is fair to assume that this success was entirely due to the nature of the terrain, which made it possible thus to deceive Bragg with the idea that Shelbyville was the objective; and to mass the main Union force against Tullahoma, with almost no opposition, and thence threaten the Confederate line of communications to the extent of causing Bragg's retreat; neither of which results could have been so easily attained if the country had been open; and it may be presumed that had it not been for the severe rains which delayed the 21st Corps at least two days, thus preventing a battle that would probably have taken place at some point between the fortifications and the Tennessee, Bragg's army would have run the risk of total defeat. It is possible that the strong impression then produced of the importance of the results actually attained, may be somewhat due to the fact that this operation was the first well-defined and successful exhibition of strategy, in which an entire army participated, of which we had had any experience or knowledge in the western field of operations.

In the continuation of this campaign, during September, 1863, from the Tennessee to the battle-field of Chickamauga, a distance in a direct line of but 25 miles, three ranges of mountains thickly wooded were crossed. The city of Chattanooga, located at the northern extremity of the middle range, was soon evacuated by the Confederates. In this advance, the Union forces were widely separated: two corps crossing the middle range, one about 46 and the other 25 miles below Chattanooga, while another remained in observation near the city and in the vicinity of the Confederate army, which outnumbered it three to one. That such a movement or disposition of its forces was possible, without destruction of the Union army in detail, was due entirely to the nature of the terrain: the screen afforded by the mountains and woods prevented the Confederate commander from perceiving his opportunities.

From September 21st until November 24th of this year, the Union army was besieged in Chattanooga; and here again the terrain exercised a powerful influence. The main line of investment occupied Lookout Mountain to the south and the hills of Missionary Ridge on the east, while the Tennessee enclosed the Union army on the other two sides. The only railroad that had

been available as a means of supply passed along the base of Lookout, hence the line of communications was diverted to a circuitous and very difficult route through the mountainous country, north of the Tennessee, to the rear of the city. So difficult, indeed, was this route, that even with the expenditure of 10,000 mules in transporting supplies over it, the Union army was reduced to extremities in both food and clothing before reinforcements arrived from the east and west, and the battle of Chattanooga raised the siege.

As an incident of this part of the campaign, and as illustrating the moral effect that certain conditions of terrain in military operations may have;—when, by reason of their defeat at Chickamauga, the Union forces had retired to the intrenchments at Chattanooga, the presence of the deep and broad Tennessee immediately in rear, added much to the universal feeling and resolve, that no effort of the enemy should succeed in driving them from the position.

The struggle for the possession of East Tennessee, by reason of its peculiar topography no less than its geographical position, was, throughout, a most important factor in the operations of our war. Its mountain barriers and central situation made this region the "Keep of the Confederacy"; its fertile valleys furnished, early in the war, a considerable portion of subsistence for the Confederate armies, and were traversed by the most direct railroad route between their eastern and western fields of operations; hence, the desirability of its possession by either side made it the scene of hard-fought battles and persistent sieges, of which the difficulties attendant upon tactical combinations and supply were almost entirely due to the rugged nature of the terrain.

That part of East Tennessee, east of Knoxville, together with Eastern Kentucky and West Virginia, constituted a field of operations known as the "Mountain Department." It consisted "practically of about 500 miles of mountain ranges," and was in reality a wooded wilderness crossed by very few and most difficult roads. The country was so wild that but little forage could be found in it; and, in the marches across it, the teams could hardly haul their own provender for the round trip. But the effect of terrain of this description and location on the general operations of the Union armies was beneficial in the highest degree. It constituted an almost self-defensive curtain between

our salient eastern and western fields of operations. Although this region was not entirely devoid of severe engagements, which took place more especially along its borders and in the early part of the war, comparatively small bodies of troops judiciously disposed proved sufficient, during the entire period, to protect the rich valley of the Ohio beyond it from invasion.

(b) Battle-fields and Positions.

As in strategy, the arm with which a force is equipped has but little bearing on the mode of application of its general principles, so in tactics, the general dispositions and combinations of forces on and in the immediate vicinity of the field of battle, are now only modified by the introduction of the most modern weapons, to the extent of prescribed greater intervals and distances. The most important elements of direction of attack and vantage positions are governed by the same conditions as in the time of muzzle-loaders; hence, it is not deemed necessary, in seeking for instructive examples for the further elucidation of this subject, to be confined to the most recent foreign wars in which alone breech-loaders were universally employed. Cover from the enemy's fire and vantage ground have been desiderata since the time when hand-to-hand weapons were replaced by projectiles; and recent improvements in fire-arms, by which distance has been overcome to a still greater degree and rapidity of fire increased, have only broadened the field of action, enforced the dispersed order to a greater extent and earlier in the battle and probably hastened the termination of the struggle. Nearly all battle-fields where fire-arms have been employed afford valuable information on the subject in hand.

The terrain in and about Vicksburg, the scene of Grant's operations from November, 1862, to July, 1863, consisted of a series of irregular hills, bluffs and narrow tortuous ridges, in many cases thickly wooded, with numerous streams varying in magnitude from that of the broad Mississippi and its bayous to the narrowest water-course which could offer an obstacle to the passage of troops; hence, "it was easy for an inferior force to delay, if not defeat, a far superior one";—witness the result of the battle of Chickasaw Bluffs, in which 33,000 Union troops were repulsed by 25,000 Confederates, with losses of 1776 and 207 respectively (Official Records); also the difficulties attending the final advance from Bruinsburg, when every hill and stream was

occupied to delay the progress of the Union army, and reconnaissances were constantly required between the different corps in order to maintain supporting distances over practicable roads. Vicksburg itself, by its peculiar topography, was a natural fortification, requiring hardly more than the emplacements which were made for men and guns to make it fairly impregnable to assault. Attacked from the north, south, or west across strong defensible positions and almost insuperable obstacles, with its eastern communications open for supply and reinforcement, it could have held out indefinitely; and the military skill and judgment of General Grant is in no instance better shown than in his tactical combinations and dispositions, in which the topographical features were made to subserve his purposes; and by which this line of communications was closed, Pemberton's army isolated, and the stronghold reduced by regular siege operations.

At Fredericksburg, December 13, 1862, the configuration of ground was the all important aid to success of the Confederates. Marye's Hill was a central salient of the Confederate position, which occupied a range of hills or bluffs extending from a sharp bend of the Rappahannock, the left of the position, in a southeasterly direction and generally parallel to this river, for a distance of a little more than seven miles. Between the bluffs and the river, an average distance of 2000 yards, was a natural glacia, intersected near the left by a canal, centrally by two runs, or narrow water-courses, with a few scattered gullies, and opposite Marye's Hill by the town of Fredericksburg on the river bank. Marye's Hill was regarded as the key to the position; and possessing at its foot a road, enclosed on its outer edge by a shoulder-high embanked stone wall, behind which were about 2500 infantry, reinforced when depleted, and with its front swept by direct and cross artillery fire, it proved impregnable to repeated assaults; and it can be safely said that its strength was such that a force, double that which attempted it by frontal attack, could not have gained it in this manner. The influence and effect of such a powerful aid to the defense on the operations of the Union army were so positive, as to render nugatory all attempts made during the battle to defeat the Confederate army.

The special feature of the terrain at Chancellorsville, May 1st to 4th, 1863, that had the greatest effect in this battle, was the woods; which, while serving as a screen for the Confederate flank march and attack, interfered with the tactical movements

of the right and main portion of the Union army to such an extent as to prevent a proper disposition of the lines and effective handling of supports. When the favorable time and opportunity for getting out of the woods, by a movement to the more open ground beyond and toward Fredericksburg, had passed, the outlets of avenues through the woods and leading in this direction were so strongly held and fortified by the enemy, that an advance then by columns, the only practicable formation under the circumstances, was deemed impossible.

Gettysburg, July 1st to 3d, 1863, was fought over a tract of country consisting of an irregularly disposed series of ridges of varying height having both abrupt and gentle slopes, quite broad intermediate valleys, and with scattered hills of more or less degrees of prominence. These conditions together with the village, numerous roads, alternately cultivated and wooded land, and the farm buildings and enclosures, made of the tract a typical battle-field in which each arm could act, at least during the earlier stages of the battle, with an effect corresponding to its special scope and power. The topographical formation was particularly well adapted to artillery, for which commanding positions with natural glacis were available on both sides throughout the battle. Round Top, thickly wooded and with rugged surface, the natural support of the Union left, and commanding a fine view of the enemy's movements; and Little Round Top, the key to the position, with their projecting spurs, were strong flank defenses to Cemetery Ridge; and, as such, by their enfilading fire proved their value in a marked degree on the last day of the battle. Cemetery Hill and Culps Hill served a similar purpose on the right. Cemetery Ridge, the curtain about 3000 yards in length, extending from near Little Round Top to Cemetery Hill, commanded gentle slopes to the front; and, altogether, the Union position was a strong one. Seminary Ridge and the ground in its vicinity offered likewise a strong position to the Confederates.

Terrain of this description has always, as in this instance, led to hard fought battles and great losses to the contestants. Presuming the exercise of due vigilance on either side and no great disparity in numbers, the side which attacks finds the other strongly posted; and, provided no serious tactical error is committed, perseverance alone gains the victory. Two serious tactical errors on the part of the Confederates contributed greatly to

their defeat, viz., delaying the attack on the Union left from the morning until 4 P. M. July 2d, which gave time for the arrival of the 5th Corps; thus indirectly forcing a battle on ground disadvantageous to them as the attacking party; and the other was the reckless although heroic charge of July 3d up the glacis of Cemetery Ridge, of which the disastrous result was predicted by some of their own general officers. In these instances, at least, the importance of the elements of terrain in tactical dispositions and movements seems to have been ignored.

In the battle of Stone's River, December 30th to January 1st, 1863, the Confederate commander had many advantages in the execution of his plan, which was the counterpart of the Union commander's, not the least of which was his intimate knowledge of the ground.

At Perryville, October 8th and 9th, 1862, the occupation of Chaplin Heights by the 3d Corps of the Union army had a very important bearing on the result, enabling this corps, after holding the position against a fierce assault, to prevent a continuance of the demoralization of the 1st Corps on the immediate left.

Space assigned to this subdivision of the subject will permit of but one more example from this source. It deals with only a small force on outpost duty, but is a neat illustration of the advantage which knowledge of the ground may confer in the face of overwhelming odds. It is described in Sheridan's *Memoirs* as the battle of Booneville (July 1, 1862), and was a cavalry contest, 827 on the Union side against over 5000 Confederates. Previous to the battle, General (then Colonel) Sheridan had made himself very familiar with the country, by traversing it in various directions and preparing rough sketches of the topographical features. The Union pickets were posted immediately west of a wood which extended eastward nearly to Booneville, distant three and one-half miles, and were first attacked by the head of the Confederate column. Slowly retiring to the edges of this wood, the pickets made a firm stand across the junction of two roads, one south of the wood and the other traversing its northern portion, and both leading to Booneville, and were there reinforced by four troops which dismounted and formed line. A direct attack failed to dislodge them; but soon flanked, the line retired along the southern road to a stronger position where they were again reinforced by the entire command, excepting four troops reserved for a special purpose. Soon the Union left was so far

outflanked that the capture of Booneville and of the entire command was imminent. Sheridan then assuming the offensive, despatched the four reserved troops along the circuitous wood-road, the northern one of the two above referred to, with orders to turn back along the other road and charge in column the rear of the enemy's line. These orders were strictly carried out, and, in conjunction with a simultaneous attack by the main force, resulted in the complete rout of the enemy.

Turning now to the Franco-German War for a few more examples, a very instructive one is afforded by the battle of Spicheren, August 6, 1870. As this was one of the initial battles of the invasion, its loss to the French was very destructive to their morale; and, although severely contested, defeat was due less to slowness and inferior equipment of the French, than to their lack of acquaintance with or neglect of, the relations of terrain to military operations, while the Germans possessed a practical knowledge of these relations to a very high degree.

The French position included the town of Spicheren, situated on a plateau about three miles (English units are used throughout) south of the Sarre River, which here trends eastward, and the village of Stiring, which is about two miles west of Spicheren and on much lower and comparatively level ground. Thickly wooded and abrupt declivities practicable for infantry only intervened between the town and village. The base line, or lowest contour, of the plateau above referred to, beginning at Forbach one mile southwest of and skirting Stiring on the rear side, extends northeasterly to a prominent spur about one mile north of Spicheren and then trends to the east. Thick woods, unoccupied by the French, flanked their position on either side.

Thus the combat front was divided into two parts; the plateau, including the narrow spur in front of Spicheren, and the plain in front of Stiring; while the Germans, debouching from Saarebruck, opposite Spicheren and on the river bank, deployed on open ground and could employ a converging artillery fire on the French positions. Briefly, 16,000 French on a front of about two miles, were attacked by 15,000 extended on a front of about three and one-half miles; and, up to 3 P. M., after a severe struggle for possession of the spur and of Stiring, held their ground. The German infantry took advantage of the cover afforded by the woods on either flank while the French fought in the open. The Germans were then heavily reinforced

and their opponents' artillery being overpowered, the spur was gained; as were also soon after, notwithstanding a reinforcement of the French, the woods on its right, as well as parts of the line between Spicheren and Stiring. Nearly all of Stiring was soon also in possession of the Germans; and the defeat of the French and their withdrawal to Saareguemines were ensured at nightfall by the Prussian turning movement toward Forbach.

In the relations of terrain to these tactical operations, it is observed that a wide interval weakly defended where defense could have been powerfully aided by natural obstacles, existed between the two parts of the French position; that the woods flanking the position were also not only not properly occupied as against infantry, but that they limited the effective artillery fire to narrow sectors, preventing enfilade of the attacking lines and facilitating convergence upon themselves; and that especially at Spicheren the French had not only insufficient room for deployment, but from their own dispositions were compelled to fight in the open while their opponents availed themselves of shelter on every side. Doubtlessly as claimed the offensive was contemplated by the French, and it was not intended to fight a purely defensive battle in this position, but certainly for disadvantageous elements to the defenders, it would be hard to find a parallel case even in our Civil War.

The battle of Woerth, (known also as Fröschwiller and Reichshoffen) August 6, 1870, resembled in some respects Antietam. The general topography of the field was similar, the Sauer, although much narrower than Antietam Creek, corresponded to it in position: the undulations, woods and cultivated ground on either side were disposed in much the same way, and the turning movement of the XIth Corps, and fierce contests in the left centre of the French position had their counterparts in the Confederate lines. While the disparity of numbers on the French side, which was somewhat greater than that of the Confederates at Antietam, would, on ground of this description, and as against equally brave and persistent antagonists, most likely cause their defeat, there are several points to be noticed which are pertinent to the present subject. The French position was so near the Sauer as to be commanded by the guns of superior range on the opposite bank: the bridges over this stream were neither destroyed, nor was the shelter afforded by the banks exposed to the defenders effective fire; and the ridges extending from in

rear of the village of Woerth to the right, and which dominated the avenues to the French position, were not defensively prepared—the flanks were unprotected—as at Spicheren, a wood on the left afforded screen and cover for a turning movement, and an elevation on the right which could have been judiciously made use of for field works, and at least have delayed the turning movement in this direction, was left unoccupied. Throughout the battle, the Germans, in availing themselves of shelter at numerous points in the front line, showed great practical experience in turning to account the accidents of ground.

At Rezonville, August 16, 1870, the German infantry, although numerically inferior, held their own by making use of shelter, by advancing from cover to cover on the front and flank. By occupying the woods on their right and centre, they strengthened their line, while the French infantry “held only patches in the northern part of the woods of Trouville,” which conditions were tactically very disadvantageous to the French as was made evident during the progress of the fight.

An examination of the official map, shows that the French position at Gravelotte (August 18, 1870), from Roncourt on the right to the left at the bluff in front of St. Ruffine, at a distance nearly due south about 8 miles and 1000 yards from the Moselle, was comparatively level, commanding ground. To the right of the centre, the configuration partook of the generally undulating character of the surrounding country and the ground sloped gently to the front, but from the centre to the left, a parallel ravine intersected the front and this slope became gradually more abrupt until near to and along the Moselle it was steep and difficult. Another parallel ravine immediately in rear and extending from the Moselle within 3000 yards of Roncourt, was traversed by a broad highway, which afforded excellent cover for the reserves and transfers of troops. Ste. Marie, an occupied village about 2000 yards in front of the right, and the smaller outposts of the centre and left, were also on well disposed ground and protected by cross artillery fire. Woods and vines covered the slopes on the left; a wood about one mile broad, its outer edge occupied, was situated immediately in front of the left centre, and another of less extent and density, about one mile in front of the right centre. Numerous roads traversed the position and the ground in front and rear; and copses, hedges, fences and ditches were quite numerous over the entire country.

The main defects of the position were the absence of a natural support for the right, which, it is considered, might have been obtained by resting the right upon the forest and quarries in rear of it; and the cover afforded by the woods, copses and depressions in front, which, once gained by the enemy, served as points from which to renew the attack. Although the ground to the west was lower than the French position, the numerous woods and villages and the slight elevations afforded cover for the German reserves and for preliminary dispositions, and, in general, good positions for artillery; but it was found impracticable to conceal their principal movement which resulted in turning the French right. Throughout the battle, the topographical features enumerated and the shelter obtained from even slight undulations of the ground, were made use of as circumstances required by both the assailants and defenders, and particularly by the Germans who had become so proficient in their proper employment. They frequently served in the advance as protection against the severest musketry fire, in retaining advanced positions against infantry attack, and even the cross-fire of artillery. The stubborn defense of Ste. Marie by 1500 men caused the "deployment of two strong divisions and over 100 guns and thus delayed the attack on St. Privât for nearly two hours"; and when retreat became imperative, a slight ravine extending northward enabled the defenders to gain the main line without great loss. The gentle slopes to the front of Roncourt and St. Privât were particularly favorable to the defenders' musketry fire; and, when the right was turned, the woods and quarries in rear served as rallying points where the Saxon cavalry was forced to discontinue pursuit.

Pont Noyelles, December 28, 1870, shows on the part of the Germans the strength given to an attack by the constant employment of shelter for infantry during preparation for the attack and the advantages derived from the use of declivities, valleys, and slight surface undulations to screen infantry movements; and the defense of Belfort, in an advanced position on the Lisaine, January, 1871, how the configuration of surface and the woods, streams and roads were carefully studied and skillfully utilized. Also in the French retreat to the Loire, December, 1870, the occupation of the villages to the north of the forest of Marchenoir caused this feature of the terrain to serve as a mask to their movements.

The Swiepwald, or Maslowed wood, at Königgrätz, was, July 3, 1866, the scene of a most stubborn contest because its retention by the Prussians formed the connecting link between the two armies; and the villages along the Bistritz were effectively employed as defenses against the Austrians, while the stream itself served as a protection to the Prussian right.

Frederick the Great, in his encounters with the French and Austrians, showed his keen appreciation of the value of terrain as an element in tactical problems, and his skill in utilizing it is well shown in the familiar battles of Rossbach and Leuthen.

(c) *Marches.*

The controlling idea on which the orders for a march against the enemy are based is "to reach him as soon as possible with all available forces, and so as to deliver the blow at some advantageous point." The next in logical sequence and for present consideration is the manner in which the nature of the terrain enters into the proposition.

The rate of march over different kinds of ground is an important element to be considered. A careful study of the marches made during recent wars gives these results: on fair roads, small bodies of infantry move at the rate per hour of two and three-fourths to three miles per hour; field artillery, three and one-half to four miles, and cavalry and horse artillery five miles. Large bodies are regulated in their rate of marching by that of the infantry, which, under these circumstances, varies from two to two and one-half miles, but on sandy or muddy roads this may be reduced to one mile. Wagons heavily loaded, on fair roads, move at the rate of two miles per hour. The mean distance for a day's march of a corps, on fair roads, is generally conceded to be 14 miles. The mean daily distance for an army composed of several corps was under Napoleon, with his disciplined veterans, about 14.5 miles; and in 1870, of the German army, 13.75 miles; but in these two cases it is to be remembered that previous training and strict discipline were important factors, and that, with some exceptions in Napoleon's campaigns, good roads were available. In computing the time necessary for traversing considerable distances, requiring several days, an allowance of one-third is usually made for rest, thus making the average rate of march of an army over fair roads about ten miles per day.

In both marches and battles varieties of soil and climate are to be considered in connection with configuration of ground. In the temperate zone, as well illustrated during our Civil War, it seems to have been the rule, with but few exceptions, that marches against the enemy, as well as battles, should be accompanied by rain; and when to unfavorable configuration were added the obstacles of impassable roads, soft-surfaced fields and swollen streams, incident to severe and protracted rains, time as dependent upon distance became a very uncertain element in the computations. Numerous instances, however, show that no matter how difficult or seemingly impracticable a country thus becomes, such obstacles but develop the energy and devotion needed to overcome them.

Of the different arms, the artillery is naturally most affected by difficult roads, and two instances are given as evidence of its overcoming "insurmountable objects." In April, 1862, during the expedition against Cumberland Gap, the guns, including 30-pdr. Parrotts, were dragged by the Union troops over the Pine and Cumberland mountains, "at times by means of block and tackle, at others by putting in as many horses as could be made to draw, and again by men, 200 at a single piece, hauling with drag ropes." (G. W. Morgan.) A similar instance, during the Atlanta Campaign at Rocky Face Ridge, May, 1864; in order to take the artillery up the steep declivity, where we had to grab the underbrush to maintain our footing, it was dismounted and the heavier parts hauled up by drag ropes and tackle attached to the trees and rocks. In several instances during our Civil War, the ordinary travelled roads were so bad and the wheels sunk so deep that the axles swept broad paths through the mud for miles at a stretch.

As theory presents such obstacles as "impracticable," and thereby to some extent inculcates wrong ideas for the inexperienced, it should be offset by the great master's motto, "In war, nothing is impossible."

That the nature of the terrain has an important bearing upon marches made in the vicinity of the enemy, aside from imposed rate and transportation difficulties, is amply illustrated in military history. Not only did the Blue Ridge Mountains serve the Confederates admirably as a screen in both their advance to Gettysburg and retreat therefrom, but immediately after the battle, in their march to the Potomac, the close country, rendered still

more difficult by heavy rains on several days of this movement, may be said to have saved their army from much greater loss. It was the general opinion at the time that the character of the country gave the Confederates such excellent facilities for defense as to make an immediate pursuit and attack unadvisable. Similarly the Austrians, after their defeat at Königgrätz, availed themselves of the Carpathian Mountains as a screen or defense in their retreat toward Vienna.

Flank marches, or those made parallel to the enemy's front, depend very much for their successful execution on the nature of the intervening terrain. The interposition of a mountain range, or river, or other obstacle of considerable extent, will usually, when joined to celerity of movement, make such operations safe. When this protection does not exist, great care is required in preserving such formations and dispositions as to resist a sudden flank attack, and particularly in patrolling the intermediate ground and in occupying those points favorable for such an attempt, by sufficient numbers and in sufficient strength to guard against surprise.

(d) *As exemplified in general by the Germans, in their tactical operations of 1870.*

When the Germans entered upon the war of 1870 they had been trained in "applied tactics," a term meaning, as generally understood, the application of battle formation to all kinds of ground, and there was no injunction more carefully laid upon them, or that had been more thoroughly impressed by practice in field manœuvres and battle drills, than this; that in the attack they should take every advantage of the ground consistent with effective action, and that the destructive fire of the modern breech-loader made this imperative; and when, in subsequent combats, this rule was departed from in a marked degree, attention was called in orders to its non-observance.

The education of the Prussian army for this campaign consisted mainly in practical examples as opposed to abstract theories, and one of the most essential parts of it for all, from the corps commander to the private in the ranks, was the cultivation of the "eye for ground," so that on every occasion, the arm and tactical formation best suited to the terrain could be quickly determined and used; and by this wise use of the topographical features, joined to a proper appreciation of the situation, perseverance in the attack was to ensure success.

This careful training gave to the Germans a remarkable degree of superiority in the combats which took place in either broken ground, or enclosed country; as, for instance, in the six days' fighting which preceded the capture of Le Mans, January 12, 1871, and in the wood and village combats which were of such frequent occurrence throughout the war.

Careful reconnoitring previous to the attack was required, because, particularly in broken ground, a direction once taken by troops in dispersed order was difficult to change. On the defense,—it was contemplated by the Germans, however, that they should always assume the offensive,—old rules were to apply; consequently the best position was considered to be heights, or grounds somewhat elevated above the surrounding surface, sloping gently to the front, and with good natural protection for the flanks. In those infantry engagements which took place on broken ground, or in woods, company columns, with skirmishers well to the front, were used to guard against surprise; and because, in combats on ground of this character, the tactical units became as at Fröschwiller very much disorganized, it led to the belief that it would prove beneficial to include in their course of instruction thereafter, the handling of troops belonging to different organizations thus accidentally brought together. (Boguslawski.)

The borders of woods and villages, rather than the interior, proved to be the most important parts to hold; this especially because the breech-loader made cover more desirable; and, as a consequence, in the villages, where disinclination to leave cover was observed, caused the contests at certain points to be disadvantageously prolonged.

The noted cavalry charge at Mars-la-Tour, August 16, was made on ground favorable for this arm, and the attainment of the desired object, the retention of the French army, was by this heroic act greatly assisted. On unfavorable ground, the cavalry was withdrawn when the infantry advanced to the attack; but in their extensive and generally most effective patrol duty, as well as in the examination of the country, a duty especially enjoined upon the divisional cavalry, even very broken ground was not avoided. The lancers on broken ground, against cavalry armed with the *chassepôt*, proved entirely inefficient.

As to the artillery, previous reconnoitring, which was had in most cases, enabled it to avoid impracticable ground and to

select favorable positions. At Sedan, the artillery of the 5th and 11th Corps pushed forward over difficult ground and deployed even in front of the advance guards; and at Vionville, the artillery of the 9th Corps took position on open ground in front of the infantry, whose watchful care prevented its loss of guns, and when the infantry advanced, the artillery moved in turn to its support.

The contests for dominant points upon the battle-field, because of the greater power and consequently wider command of modern artillery, were frequently very fierce and difficult to decide. "The mitrailleuse was ineffective on troops under cover." (Boguslawski.)

As to the lines of investment of Paris and Metz, they were, as is customary, accommodated to the configuration and nature of the ground; but heights were taken in, even if near the French lines; "villas and chateaux were converted into fortresses, and woods into impenetrable obstacles." Abattis, placed within easy range, was extensively used in woods and on broken ground. Rifle pits were carefully located in reference to the configuration of surface; on the heights, so that no dead angle protective to climbers could exist; on low or level ground, so they could not be looked into; and they were so disposed as to connect the improvised fortresses above described, and which formed the supports. Trenches or barricades closed the entrances to villages. Park and garden walls were carefully prepared and furnished with block-houses and tambours at the angles; and an obstacle of this kind running through a wood was considered of great value.

The Meuse River was dammed, and arrangements were made to flood the level country adjacent. Hills and woods afforded positions from which to cannonade safely the French outposts. On account of the enclosed nature of the suburban country, and the advantage taken of the terrain in the investment, there appears to have been no space left available for effective employment of troops engaged in a sortie.

II.—ANALYSIS OF TERRAIN IN ITS RELATIONS TO MILITARY OPERATIONS.

(a) *Mountains and Rivers.*

A mountain range parallel to the line of march is an aid to an invading army, and perpendicular to it an obstacle; in either case the main condition being the possession of its defiles; for

if these are held by the defenders then, in the former case, the invaders' line of communications is in danger, and, in the latter, his advance is seriously delayed. As mountainous districts are sparsely settled, the roads, besides being difficult, are few in number; transportation is thereby hampered and movements cannot be accurately timed; and as such a country is unfavorable for cavalry, reconnaissances are seldom as thorough as desirable.

A defensive force posted at many points of a mountain range, its parts being thus isolated from each other, invites the assailant to break through at any desired point; and if the range is of small extent and well guarded, the position will very likely be turned instead of directly attacked. By the natural protection afforded for its flanks, and the narrow front on which a direct attack must be made, a force can usually hold a given point against great odds; but the narrow practicable spaces of mountain summits do not as a rule permit of many troops being assembled at isolated points, and if it is found necessary to endeavor to hold the entire position, or mountain barrier, the best direct defense appears to consist in occupying the principal passes by echeloned field works so arranged as mutually to protect each other. Such a system would leave the greater part of the defender's army free to oppose a flank or turning movement, and the existence of field works would go far toward avoiding that condition of defeat expressed by Napoleon, "In all combats in mountain passes, the columns once broken are thrown into confusion upon each other and fall into the power of the enemy." Napoleon also considered it a mistake "to make the principal attack in a mountainous region abounding in strong positions favorable for defense."

The actual or direct defense of a barrier of this kind is in any case a difficult and uncertain problem, and particularly so because a strong demonstration upon the fortified position is so often successfully used as a mask to a turning movement, and the assailant's main force reaches the defender's territory without opposition.

Probably the best course is not to attempt a direct defense, but, holding the main army at suitable positions in rear, to occupy the passes with small detachments, which, by careful observation and such opposition as they are able to offer, serve to give warning to the enemy's approach, and then to attack his columns as they debouch from the defiles.

Similarly to a mountain range, a river entering the enemy's territory is a natural line of invasion, and forms a flank support for the invaders' army ; while perpendicular to the line of march, it is an obstacle to a degree depending upon its breadth, depth and rapidity of current.

The two general classes of rivers are those contained in narrow valleys, and others which traverse broad valleys or plains. As a rule, the banks of the former class are in many places thickly wooded and intersected by ravines, consequently the points favorable for crossing are numerous, and good cover is afforded the assailants both during the passage and on reaching the farther bank. A disseminated line of defenders would offer but weak opposition ; hence, as in the case of a mountain range, it would probably be best to make a similar use of small detachments, and occupy with the main army suitable positions in rear of the river and from which to fall upon the enemy's columns with forces superior to those he could assemble at any point.

Those rivers which traverse plains present a very different problem. Their direct defense is easier for various reasons ; existing bridges are protected by field works ; an attempt to lay pontoons or to construct any other kind of bridge, is more easily observed, the usually greater breadth of these rivers prevents the most effective use by the assailants of their infantry until, when approaching the defender's side, they are exposed to a converging and most destructive infantry fire, and it is difficult, on account of the broad curves of a stream so situated, to find a point of crossing such that a superior concentrated artillery fire will fully protect it.

Moreover, the roads usually found in the near vicinity of such rivers, facilitate concentration of the defender's forces, and villages and tributary streams present excellent flank positions whereby the assailants, if the crossing is effected, are obliged to fight under very unfavorable circumstances.

A most judicious and safe disposition of the defender's army is one which permits of a force double that of the invaders to be brought against the latter at any point of passage ; and in estimating the interval that may be allowed between the parts of an army guarding a river, so as to ensure this concentration of superior forces, it may be well to note that it usually requires at least five times as long a period to construct a bridge under fire as it does in a course of instruction.

On the side of the offense, numerous islands and wooded banks facilitate bridge laying, by making observation and defense more difficult, and would facilitate the adoption of the plan usually followed; that of making a demonstration at one point and crossing at another, thereby endeavoring to avoid the great loss incident to a direct attempt in the face of the enemy's main force. A very important condition to success is that the nature of the terrain on the defender's side shall when reached afford both room and cover for deployment, and for continuing the attack.

Supposing a passage of either a mountain range or a river effected; then, in the former case, the situation of the invader is much safer, as he can advance without being exposed to flank attack, and if defeated has a line of retreat that can be easily guarded, two conditions nonexistent in the case of a river.

A line of railroad at a suitable distance from and parallel to either mountain range or river, would obviously be of great assistance in the attack or defense.

Natural agents here exert their power in a remarkable degree; heavy snows render mountains impassable, while severe cold makes rivers passable at any point.

The control of a mountain range or river and their defiles constitute a powerful lever in the hands of an expert commander; and the passage of either on the enemy's flank, or in his rear, is always followed by serious consequences.

(b) *Marshy Tracts.*

If of considerable extent, marshy tracts present greater obstacles to the assailant than broad rivers of the plain. Aside from the difficulties attending the construction of a passage way, it is next to impossible to drive the defenders from their position by superiority of artillery fire. The crossing is somewhat favored if dry patches exist here and there, still the advance must be made on narrow fronts exposed to converging fire. Frost, or an extremely dry season, may intervene to favor the passage, and so may a heavy rain to make it impossible. If the passage is successfully made, there is not, as in the case of a river, a bridge in rear requiring protection; but on the other hand, there is no effective artillery fire to cover a retreat.

(c) *Woods.*

Woods offer concealment to army movements, strengthen

lines of defense, and to some extent protect the occupants against the enemy's projectiles; but they prevent effective employment of artillery and cavalry, and, in general unity of action. As the defender must observe every movement of the enemy in order to make proper dispositions to meet the attack, it follows that a feature of this kind either in his front, or covering a portion of it, is a great disadvantage. He should be either along or in the prolongation of its outer border, or in front of it, according to the configuration of the ground; in any case, being so located in reference to it, that it may serve to conceal part of his own forces if necessary, or as a cover for retreat in case of disaster. On the part of the assailant, if an extensive wood or forest is met with in the vicinity of the enemy, and it is traversed by several roads or is otherwise practicable, it may assist him in effecting a surprise; but ordinarily, streams, heavy undergrowth, or deep ditches, exist here and there, and, except in low lands, ravines and rocky patches are generally quite numerous; besides it is seldom that a description of the location and extent of these obstacles, sufficiently exact for rapid or combined movements, is obtained. The defense of a forest against the enemy's advance could be similar to that of a mountain range, or of a river in a narrow valley, heretofore described. Warning of the approach of the enemy's columns would be obtained by small cavalry detachments thrown well forward into the forest, and, if there are suitable roads, it would be accompanied by sections of horse artillery, while battalions of infantry guard each of the main issues. From 1000 to 1500 yards in rear, is assembled a strong force of cavalry and horse artillery as a support, and for use in contesting the issue from defiles not otherwise guarded, while the rest of the army is concentrated on favorable ground still farther to the rear, in one or more masses within supporting distances of each other, and near the prolongation of the enemy's line of operations, or of its own line of retreat. Such dispositions would in ordinary circumstances, it is believed, invariably lead to a successful defense.

The result of a contest in the interior of a forest or wood, and when the odds are not very great, is very uncertain to either side engaged, because of the obscurity which veils the main attacks, and the difficulty in securing unity of action. There should be no half way measures in this case; at the critical moment, either the defenders should retire simultaneously to the open country, or, better, push forward with the greatest

audacity and determination, which effort would ordinarily meet with success.

A wood of moderate extent, situated in front or on the flank of a position, may exert a powerful effect in either the attack or defense. It is a most valuable aid to the defense, if the edges exposed to attack are strongly occupied; and, whether these are straight or irregular, a disposition of the forces similar to that made in the case of a regular fortification, and a like preparation of the front for effective fire and for preventing the assailant's freedom of movement, would make the wood impregnable, or at least so difficult to gain that an attempt would be warranted only by very urgent circumstances. Its possession by the assailant gives him a most effective support to renewed assaults, as it is usually just as difficult to drive him from it as, in the first instance, it was for him to gain it.

(d) Plains.

Plains, or gently undulating and comparatively open country, are usually, as already stated, the scenes of the greatest battles. This is mainly due to the ease with which on such ground large masses can be moved, and because the commanding general can personally observe the various dispositions and local results, and can order in his reserves as occasions demand, thus in some cases, if needed, causing his entire army to take an active part. Terrain of this description is most favorable to concentration, and lends itself to a ready establishment of preponderating strength at the decisive point. The demoralizing effect of uncertainty as to the enemy's movements, peculiar to a close and difficult country, is absent and cavalry can join in the pursuit and render victories more complete.

An open country as a rule hastens the conclusion of a campaign; but it may retard it if the weaker side is superior in good cavalry and artillery, and its forces possess greater mobility; if the enemy is not skillful in handling large masses within narrow limits; if water courses and accidents of ground divide the open country into several fields of tactical operations in area proportional to the several forces available; and when the defender possesses fortified places or retreats, into which he is not to retire except in extremity, but near or in rear of which he can seek shelter in case of need, and whence he can issue at an opportune moment. The defender can then, by isolated, vigorous attacks,

reduce the disproportion in strength until a fair equality exists between himself and the enemy.

To manœuvre an army properly either on the offensive or defensive in a country of this description, partly open and partly covered, occupied here and there, and intersected by streams of various dimensions and series of ridges or hills of moderate elevation, requires military ability of the highest order, and an intimate knowledge of the terrain and its relations to military operations is absolutely indispensable.

(e) Communications.

Railroads, ordinary roads and rivers are the three general classes of communications. Railroads, strategically considered, exert a powerful effect in the concentration of armies at desired points in the theatre of war. As a means for supply of men, horses, subsistence and other stores, and for transportation of the wounded they are considered as an indispensable adjunct in modern warfare. They are prompt in service, and in a measure dispense with a fixed base or depot, by enabling supplies to be drawn from cities located in different parts of the theatre, and in different directions from the scene of operations. In our Civil War there were notable instances of their value, among which were the various transfers of troops between the eastern and western fields of operations, and the supply of the armies engaged in the Atlanta campaign; and through similar facilities afforded in the Franco-German war, they were the means by which the Germans were enabled to keep their large army continually on the move and at work driving the French into disadvantageous positions.

Ordinary roads are still, however, the principal routes for army movements, and the only ones in the enemy's vicinity. They are therefore of the greatest importance and require the greatest care in description as to location and condition, in order to ensure the success of combined movements and to facilitate tactical dispositions in general.

Rivers are especially valuable as aids to transportation when the line of march is parallel to them, and both banks are held by the side utilizing them for this purpose.

(f) Positions.

Certain conditions of the terrain offer on the battle-field, or to

an advanced or rear guard, or an outpost, special advantages of position in the attack or defense.

The principal requirement in battle is that the position shall be commanding, in the sense of securing effective fire and observation of the enemy's movements; and, of secondary consideration, though very important, that it shall afford protection to the occupants. Comparatively level ground for actual occupation by the main line, with the front sloping gently downward toward the enemy, strong flank supports, and sufficient depth and cover in rear for the reserves, and for transfer of troops as needed from one point to another of the line of resistance, are the essentials of a good position. There should be no natural obstacle in front of such an extent as to prevent the defender from promptly assuming the offensive; but a position is strengthened by natural or artificial obstacles in front of comparatively small extent, such as patches of woods, ditches, orchards and farm-yards with their stone-walls or other substantial enclosures, buildings if strongly constructed, in fact, any feature which can be held by few men, and force the assailant to deploy under unfavorable conditions, and cause him to expend a greatly disproportionate amount of strength in securing possession of it. "Advantageously disposed ground can compensate for inferiority of numbers to such a degree, that, when the attack has become enfeebled by continuous unsuccessful effort, the defenders can take the offensive with good chances of final victory." (Derracagaix.)

To attempt a position of such strength, a frontal flank attack, or turning movement, would in general be resorted to; hence the need of strong flank supports. These may be natural obstacles, such as a river, marsh, or inaccessible heights, or ground affording extensive artillery command, so as to compel the assailant in his turning movements to make a wide detour, and thereby separate his forces to such an extent as to give the defender the opportunity for taking the offensive before a concentrated attack can be made. It may be added that in the absence of natural obstacles, the alternatives are either to intrench strongly and provide artificial obstacles, or to keep special troops in reserve for making a counter attack.

Another requirement of a good position is that it shall be proportioned in extent to the number of troops occupying it. Because of the great power of modern armament, fewer men than formerly are needed to repel the front attack; but as a turning

movement would ordinarily cause a prolongation of the line of resistance in this direction, a deep formation is still necessary. No strict rule can be laid down as to the number of men per lineal unit, as this depends upon the nature of the terrain, character of intrenchments, and other considerations; but, as a general rule, in ordinary ground and including the reserves, four per yard, a number corresponding to the results of experience in recent wars, may be taken as a basis for calculation.

The terrain in rear of a position should offer successive lines of defense; and, in any case, free movement of all arms to provide for the event of retreat. In view of the latter contingency, a river with few bridges would be a serious obstacle, while a forest traversed by known roads would prove a valuable aid in checking pursuit.

Heights do not in general afford suitable positions. They require a considerable detachment of the main force to hold the base; in fact, the retention of the latter is usually an almost absolute necessity; artillery fire from the main position diminishes in effect as the assailants approach the base, and, if the slopes are steep and the front of attack extended, it is practically ineffective as against the ascent. Isolated heights and very prominent or conspicuous points or objects within the line of defense, detract from the value of a position, in that their ready observation by the enemy assists him in directing his movements and in estimating ranges. Even in the construction of ordinary trenches, the soil thrown to the front should be covered by brush or by whatever is growing in the vicinity, so as not to attract attention.

For the advanced guard, vantage ground for observing the enemy for the purposes of attack, and which in case of repulse can be defended for a sufficient length of time to permit the arrival and deployment of reinforcements from the main column, are favorable conditions.

For a rear guard, the position should be exceptionally strong in its front and on the flanks, and afford an effective use of artillery at long ranges. An impassable obstacle in its front, or one that contains defiles through which the enemy must issue, is here of great value; and the nature of the terrain on the flanks should be such as to make a wider detour necessary in an attempt to envelop them. Because in a turning movement on either flank the pursuers gain a considerable distance toward the main column,

the next position selected for the rear guard should, if possible, be such as to offer a natural obstacle on that flank. Since an engagement by the rear guard with the enemy is solely for the purpose of gaining time, and it is important that as great a display of strength as possible should be made, the extent of a position, relatively to the strength of the force, may be considerably greater than that prescribed for a battle.

Positions for outposts should afford a commanding view of the surrounding country and obstacles to easy approach by the enemy. As one of the principal duties of outposts is to guard against surprise of the main army, the position selected for defense in case of attack should offer such facilities as to prevent, as far as possible, a retreat until the flanks are turned; and, to this end, all defiles, roads and bridges leading to it from the front are to be made impassable. Those positions of ground are most desirable which will enable the sentries to observe any movements of the enemy and afford concealment for themselves, that will give the pickets free front and lateral communications, to the supports the best mutual defense, and will permit the outpost, as a body, to maintain itself against attack until it has fulfilled its duty as a guard to the main army.

(h) With reference to the Fire-effect and the Special Arms.

Accidents of ground and other topographical features, that afford a free field of fire to the occupants and shelter from the enemy's fire, are of great advantage in securing good fire effect as well as in diminishing loss, to either skirmishers or participants in the main line of battle. The former can usually change the direction of their advance sufficiently to the right or left to gain this advantage; but the latter as a rule, must move directly forward, take the ground as it comes, and make the best use of it possible. Supports and reserves always avail themselves of such cover as the ground affords, consistently with maintaining useful positions relatively to other troops.

While trees, rocks, walls, ditches, or other prominent objects, are frequently encountered in the advance and serve the required purpose, the usually available cover consists of inequalities of ground, the men so disposing themselves in the hollows, that they can have a good view of the enemy over the summits immediately in their front. On flat ground, which however is of infrequent existence on the battle-field, the only protection available

is evidently due to diminishing the size of the target for the enemy, by kneeling, or lying down, and preserving intervals ; and in a lying down position, very slight inequalities give valuable cover. On ground higher than that held by the enemy, the men naturally occupy the farther edges of the summits.

Cover thus taken during those phases of an action which permit of it, undoubtedly conduces to the best fire effect, as the men, by the protection given, will be less nervous and can therefore aim better and select their targets with more discretion. "A rational tactical disposition consists in augmenting the effects of one's own fire, while sheltering one's self as much as possible from that of the enemy." (Lewal.)

Experience in war shows that a general alignment and preservation of the space assigned to an organization, during an advance to the attack, is all that can be relied upon or expected ; for it is obvious that to secure the advantages of cover above described, the sinuosities of surface formations and the irregular dispositions of different features, will cause parts of the line to be somewhat ahead or in rear of the others, also a grouping of men at vantage positions ; but this should not diminish the fire effect, in fact a cross fire of groups is more effective than the direct, individual fire of the same number of men ; excellent control may be had of these accidental formations, and the better cover at such points will, in regard to the enemy's fire, frequently compensate for the advantage in this respect due to extended intervals.

At short ranges, impenetrability of cover, diminished targets and preservation of intervals are, in general, with probably but one exception, the only conditions for diminishing loss ; this exception is due to the natural tendency that most men have in firing down a slope to aim too high, the projectiles thus passing over the heads of the advancing troops ; while the latter, who have the opposite tendency, fire low and hit either directly or by ricochet.

At long ranges, the curvature of the trajectory is to be considered in connection with configuration of surface. Evidently where the trajectory does not rise above the surface a distance exceeding the height of the target, the dangerous space, the space within which an object is likely to be hit, is continuous ; when normal to the surface, the dangerous space is reduced to a point and variations of surface between these limits produce

corresponding changes in the extent of this space. Supposing the firing point and target to be on the same level surface, and the plane of fire accurately determined—then, because the curvature of the trajectory gradually increases with increase of range, the dangerous space correspondingly diminishes—and if the target were at a sufficient distance, or if instead of being on the same level, it were on the near slope of a distant hill, it is plain that the dangerous space might be reduced to a point; whereas if the target were on the far slope of the hill, provided the latter conformed in direction to the course of the trajectory, a very probable supposition in the case of ordinary hilly ground, it could be hit at any point of the slope. Also in the case of a flat summit at a distance, and higher than the firing point, the latter could be so located that the trajectory, just grazing the near edge of the summit, would create a dangerous space entirely across it.

A single trajectory only is considered, but the results are similar for any number fired from the same point, as in volley firing; and, as the location of the firing point, as well as the choice of a target, which the defender likewise has, are always within the power of an assailant, it follows that a practical acquaintance with the relation of the trajectory of the particular rifle or gun in use to configuration of surface for different distances and elevations, is needed in order to obtain the best fire effect that the ground will permit.

As to the special arms, infantry has the advantage of the greatest freedom of movement when all conditions of the terrain are considered; cavalry comes next in this respect, but if the ground is unfavorable for its action, it is of little use unless dismounted, when, so far as its equipment permits, it becomes practically infantry; and artillery is last, but this arm is efficient wherever its guns can be brought into action.

The relative proportions of the special arm required in a particular case to ensure the greatest general efficiency is consequently governed to a great extent by the nature of the terrain. Thus in a moderately hilly and partially covered country, which is suited to all arms, normal proportions would be adhered to; if close and difficult, thereby preventing freedom of movement, the cavalry would be diminished, and if it also abounded in strong positions and natural obstacles of considerable extent, then to secure sufficient destructive effect, the artillery should be increased

Because the effectiveness of an arm is thus governed, a force especially strong in a particular arm should, if possible, select such ground for an encounter as will favor its action; and similarly if the enemy's chief strength lies in the preponderance of a special arm, ground unfavorable for its action, but suited to our own, would be selected: by this means compensation is often had for a considerable inferiority of numbers.

As to infantry; in the attack the terrain is particularly favorable for the action of this arm if there are natural approaches to the defender's position, such as a succession of hollows or ravines intersecting the front, or the ground passed over is undulating; if it is enclosed by fences, stone walls, or embankments, with cuts or ditches; or contains other minor features, which, while not obstructing the view, or fire, or seriously interfering with attack formations, will by the protection given against the very destructive effect of modern fire-arms, in some measure counterbalance the advantages in this respect possessed by the defenders. It is evident that the freer the front may be of such features, the more effective will be the fire of the defense; and it may be generally stated that as regards infantry, an enclosed country is best for the attack, and open country for the defense.

Cavalry, on the contrary, would be hampered in its movements by the enclosures above described, and as a rule such cover would be inadequate either as a screen from view or as against fire, moreover comparatively level ground is best for the charge; therefore a fairly level, unenclosed and partially covered country is better suited to its effective action. To take advantage of such features as will screen its advance until the near vicinity of the enemy, or charging distance, is reached, and thereby enable it to effect a surprise, is now generally conceded to be indispensable to its successful effort against battle formations of the other arms. In either attacking or holding a defile, or in action where obstacles of ground impede its progress, cavalry is usually dismounted and fights as infantry; and, if thoroughly trained for such an emergency, it could no doubt render as effective service in this respect as the mounted infantry was called upon to perform in our Civil War. It is unnecessary to state that in general reconnoitring service, raids and pursuits, and in protecting the advance and retreat of our armies during this war, difficulties due to the nature of the terrain seldom prevented the prompt accomplishment of a given task.

As artillery can make no direct seizure or capture of the enemy's forces, its destructive effect is the main consideration; hence, ground which favors this effect in the highest degree is the best suited to its action. A position is very desirable which commands by effective fire the ground within range over which the enemy may approach, and that slightly dominates that held by the enemy's batteries. Against front attack, this arm can usually protect itself, but its flanks are vulnerable, and failing the support of the other arms, a natural obstacle is needed for their protection; and water, or soft ground, or a slight sharp descent in front, is useful in catching the enemy's projectile and thus preventing their ricochet. Cover for the enemy within 1000 yards of the guns is a disadvantage. As prominent and conspicuous objects catch the eye, and their ranges have probably been measured by the enemy, their vicinity is to be avoided; as are also such points as have a distinct and well-defined background, against which by contrast the smoke of shell explosions is readily observed. As reverse slopes that nearly conform to the curve of trajectories are dangerous to horses and ammunition, caissons should if practicable be moved to the rear of the flanks. Very elevated positions are unsuitable as they prevent the full effectiveness of flat trajectories, and require an advanced position of the guns which brings them into full view; and for like reasons in the defense of a ridge, the lower spurs are much to be preferred to the principal summits. A most valuable consideration is that such concealment should be afforded, as to enable a battery to come into action before being observed by the enemy.

In the preliminary and final stages of cavalry combats, and especially in open ground, horse artillery takes a very prominent part; also in reconnoitring, when further progress is impeded by the enemy's cavalry or infantry holding a defile or other defensive position, or by a considerable force in the open. This arm then either dislodges the enemy, or by containing him, enables the cavalry to turn the position. Similarly, in rear guard combats, it takes a most important part in holding defensible positions until outflanked.

As, in the attack, artillery has in general to conform in its movements to those of the arm with which it acts, there is often but little time that can be devoted to securing advantages of ground; the best that offers must be seized quickly and with a view above all to obtaining the best fire effect, hence the value

of a quick eye for ground as a qualification for every artillery officer.

III.—CONSIDERATIONS AS TO THE NECESSITY FOR A KNOWLEDGE OF THESE RELATIONS.

In every theatre of war, prominent intersecting topographical features whether natural or artificial are, under certain conditions, either supports to a position, or serve as defensive lines; they conceal a position, or make it difficult of access, and cover deployments and movements of troops as well as protect them from the enemy's fire and from both infantry and cavalry attacks. For one side, they are aids; and for the other, obstacles which prove the more serious the more unexpectedly they are encountered.

A field of operations presents manœuvring tracts or spaces of various extent, lines and isolated points, of which the gain, or preservation, or loss, marks either the progressive or retrograde character of the contest, a success or a check for either side; and from their intimate relation to and effect upon the different operations, are all important factors of the final result. "Configuration of ground is one of the most important elements that enters military combination or calculation." (Home.) The duration of the resistance mainly depends upon the selection of favorable sections for special manœuvres and dispositions, and upon such an employment of the troops as shall be suited to the terrain.

At the beginning of every campaign, an effort is always made to concentrate a numerically superior force against the enemy; a few days or even hours delay, due as it almost always is to unexpected natural obstacles, can produce very disastrous results; to the elements of time and distance must then be added that of terrain; and the commander who, in the special case, is acquainted with this element and can most skillfully combine it with the other two, will have the advantage at the contest. A most minute knowledge of the terrain, at the point of concentration of the separate columns, is of vital importance; strong positions must be secured or, by the occupation of those beyond, put out of the reach of the enemy; in case of his previous occupation of them, the roads or routes by which they can be turned; and, in general, an intimate knowledge is needed of those locations where the least difficulty and the fewest natural obstacles

will be met with, and where the operation will be most likely to prove successful.

It is particularly in a moment of this kind, and when preliminary knowledge has not been gained, that any one having an "eye for ground" and facility in representing and describing it, can render his commander invaluable service.

After the first encounter, and when it is incumbent on one side to give way and seek a new position, then an exact knowledge of practicable routes will serve to reach that position before the defeated force can do so, or to drive the latter to unfavorable ground.

In the case of two armies marching parallel to a stream, one defending it and the other striving to effect a passage, exact information as to practicable crossings and nature of the banks, is of great assistance to either side.

The importance of knowledge of the terrain extends to all commands from that of an entire army to the smallest fraction engaged. It is very marked in cases of isolated divisions or brigades, because as a rule, they do not possess many facilities for surmounting obstacles which are encountered in their movements; and in case of an outpost driven in, or a patrol forced off its previously assigned route, great advantage will ensue if its commander is well acquainted with the practicable routes and defensible positions, which will aid in either delaying the enemy's advance, or, where retreat is imperative, diminish the dangers of pursuit.

While a knowledge of practicable routes is indispensable, it is the natural defensive power of a country that grows in importance in the endeavor to retain possession of it. Every plan of defense is based upon the probable duration of the resistance along certain defensive lines and at certain points, on the nature of which rests in great measure the strength and degree of excellence of the entire position; and due appreciation of local resistance also governs the proper disposition of the reserves.

The enemy desiring, in place of a frontal attack, to turn a position, a thorough knowledge of the country enables the defender to judge with what degree of success a turning movement may be effected, and to act accordingly. This knowledge is, in the same case, equally important to the enemy, for although seemingly impassable or very difficult obstacles are surmounted, he may find himself so situated, in regard to both the terrain and

the enforced separation of his forces, as to invite defeat in detail by a defender who knows how to profit by his opportunities.

Acquaintance with the terrain in rear of troops forced to retreat is indispensable. Armies retire nearly always by the route followed in the advance; but smaller bodies, isolated corps, divisions, etc., sometimes find it judicious, or they are constrained to choose another route; and a perfect knowledge of the ground will aid in diminishing loss and checking pursuit. "It is much better to reconnoitre ten routes too many and which are not used, than to neglect one and thereby suffer loss." (Soltyk.) It is only by this knowledge that a rear guard can check the enemy without suffering great loss, if not annihilation.

In the pursuit; if a beaten army does not suffer still greater disaster, it may usually be attributed to the lack on the pursuer's part of clear information as to the locality of defiles of all kinds which are on the route of retreat, particularly the bridges, the destruction of which may seriously compromise the safety of the retreating army. Marked sinuosities of the route favor a simultaneous flank and rear attack, and positions may be seized of such strength and so situated as to compel the already exhausted retreating army to break through with great additional loss in order to reach its destination. Even Napoleon himself after the battle of Borodino, where he had failed to employ his own officers to that extent customary with him in obtaining accurate information of the country, owed much of his losses to the use of badly executed maps, while the Russians, although less skilled in its application, possessed this information fully.

During a temporary suspension of hostilities, the nature of the terrain within the field of operations, in reference to future movements, becomes a matter of primary importance and should be an object of special study, exclusive, and conducted with great care by officers specially detailed for their ability in this work; and information as to those parts which cannot be visited is to be gained from residents or persons whose occupations would presumably make them acquainted with the country.

It is unnecessary to say more in evidence of the necessity for a knowledge of the terrain; whether the knowledge shall be of a general or special character, depends as shown upon the plan under consideration; it exists in every military operation, and military history shows that a lack of it has led to the gravest disasters.

IV. REMARKS UPON THE MEANS FOR OBTAINING INFORMATION
AS TO THE TERRAIN.

The commander of an army cannot see everything with his own eyes ; he must rely for much information upon the reports of his subordinates who should be sufficiently exercised in both observing and describing what they observe, in order that the commander shall always have, at the right time, that knowledge of the terrain which is so indispensable to the successful execution of a properly conceived plan.

General information as to the topographical character of a country may prove sufficient in strategical operations, but those of a purely tactical nature require more detailed information, because, in the latter case, the troops are frequently obliged to leave the main routes and to move in various formations in confined localities, for considerable distances, and where local obstacles might seriously interfere with combined movements, in regard to both time and direction. This need becomes greater as the distance to the battle-field diminishes, and is imperative on the battle-field itself. While an army, on account of its means and facilities for building bridges, might find a deep and broad stream a comparatively slight obstacle, it would be a serious one for an isolated battalion, and the converse would prove true in marching over a difficult road, hence, to provide for every emergency, it would be best, in any case, that information should be as detailed as possible.

The best minute representation of a tract is afforded by relief maps, where due attention has been given to contouring, for they appear with perfect clearness to the most unpractised mind ; but such means are too cumbersome for field use, and are best retained at the seat of the government. The next in order and adapted to every occasion are carefully constructed topographical maps which, to any one who has been taught practically how to prepare them, should lead him into no error in the general adaptation of tactical dispositions to the terrain. In these maps, so far as possible, nothing that affects military operations should be left to the imagination ; and to prevent errors in reading, a uniform method of representation should prevail both at the government bureau and at all schools of instruction. As an aid to the conception of a plan of operations, a map of this kind might prove even superior to actual observation of the country, because

errors in perspective, which in the field cannot be avoided except by long and continuous practice, are obviated, and there are no obstacles to an extended view. Drawn to suitable scales, parts of the country, from the entire theatre to a scale of say 1-400,000 down to small tracts to a scale of 1-50000, the most valuable information of a general and special character may be conveyed for all the operations of both strategy and tactics.

But no matter how comprehensive and truthful maps may be, they cannot replace reconnaissances made during the campaign to obtain information of the terrain; even if of a recent date, the time devoted to their preparation is sufficient to include many changes, natural and artificial. Frost, heat and moisture as well as art are continually at work with additions and curtailments of the various features, any of which may seriously affect a military operation; and the enemy is also busy in creating obstacles, such as destroying bridges and making roads impassable.

The time may come in this, as it has in other countries, when important changes in the terrain, not including those of a purely temporary character, may be kept track of and noted on our official maps; but, although some slight effort is made in this direction, the military necessity for exactness of detail does not appear to be generally appreciated.

The three general methods of map reconnaissance during a campaign are by horizontal projections, vertical projections and verbal descriptions; the first are represented in the well-known class of topographical sketches, in which the configuration is given by contours or hill shading, and the other features by conventional signs: the second, in perspective drawings, or by what are often termed outline or profile sketches; and the third, in itineraries. These are used singly and in combination, and each of them has now a valuable adjunct in photography. It is not within the scope of this essay to enter into a description of any of these methods; but some remarks are deemed necessary.

For military purposes, verbal descriptions of nearly all topographical features are very valuable, and are frequently needed to supplement maps or sketches. This is fully recognized in foreign services where itineraries of trips made at home and abroad, in time of peace, are preserved; and officers are frequently specially detailed to prepare them. Such means are within the power of every one possessing a military education and if the itinerant can

sketch well, so much the better, as a greater amount of information is then obtainable in a given period.

One of the best methods for keeping fairly up with the constant state of change is to procure the latest topographical map of the country or region visited, and to note thereon the changes as observed, a process which is also sometimes applicable in the progress of a campaign. If the scale of available maps is too small for the purpose, then the following plan may be adopted: Make an enlarged extract from the map, to a convenient scale, of that portion of the territory to be described. For localities not named on the map, adopt a system of nomenclature, which might be as follows: Roman numerals for tracts bounded by the main and minor roads or routes; letters for the roads, heights, woods, etc. Supposing this to be undertaken during service in the field, the officer in charge of the work will furnish each of his subordinates with a copy of the extract, or so much thereof as pertains to his assigned task, and will also designate the route to be followed and the points where the party will assemble from time to time. If necessary, a special report will be made on the condition of the roads, while the details of the intermediate terrain may be described as follows: "Sections I, II and III are wooded and impracticable; IV is cultivated land, mostly wheat-fields enclosed by fences, contains a few ponds without inter-communication, ground is firm; V and VI are open and hilly, contain a few detached wooden farm houses, ground is firm and stony; VI, VII, VIII and IX are flat, contain patches and clumps of trees, are intersected here and there by brooks and ditches, ground is soft and impracticable for artillery except by very few roads; at centre of IX is a series of bare and rocky elevations, etc." The individual descriptions completed, they are then combined in map form by one or more of the most skillful officers, who also make such additions or changes as may be warranted by the information available. During this field work, all features should if possible be represented by their conventional signs, and the verbal descriptions, when they will not obscure the map, are best written on the representations of the objects referred to, viz.: along the border of a wood, "thick undergrowth, impassable except for infantry"; along a road, "corduroyed, in good condition, practicable for heaviest wagons"; on a slope, its degree of declivity from different points, etc.

It is not expected that such a representation will be scrupu-

lously exact, or complete; but it should contain no vital defect, and should comprise those details most important to the proper conduct of the advancing army. A very important consideration is that its preparation is within the power of any one conversant with the effect of topographical features on tactical dispositions.

On the side of the defense, the features particularly necessary to describe are those which have an important bearing on the special situation. As a rule, the defender is in possession of good maps, but if these are not as full as desirable, the general method above described may be followed. The enlarged extract, on which the more minute details are to be represented, should contain the water-courses, marshy tracts, hill-ranges, in fact all those features which by their location or direction may serve as defensive lines or points, and their exact location and condition must then be carefully shown in detail. Successive lines of defense and their practicable connecting routes are of vital importance. Should there be but one line of defense, then such positions in its rear as have natural supports for the flank, and the rallying points, with the intercommunicating routes, must be represented. Important items to include in the hasty sketch of a position, and which are not as a rule described in works on military topography, are the range of view and the free sectors of artillery fire; the former may be indicated by a dotted line representing its limit, and the latter by right lines drawn from each point selected for the guns and limiting the sectors.

As no one can fight and sketch at the same time, parties engaged in this duty require proper protection by escorts; in fact, to gain a commanding point of view, or to examine some important detail in the enemy's vicinity, a severe skirmish may be neither an unlikely or needless event.

It may be said that no army in the world possesses a sufficiently large general staff, or engineer officers in sufficient number, to attend to these special duties; and even if it had, then, as Von Schellendorf ingeniously remarks, "it should not be forgotten that to call upon officers of the special arms to take part in reconnaissances, is only affording them the greatest pleasure." Recourse must then be had to line-officers of the different arms, and in general to infantry and cavalry lieutenants; and it is probably best that it should be so, because their familiarity in handling troops on different kinds of ground, and experience with other

tactical requirements, should better fit them for the work. It would be in the interests of the service to teach a few non-commissioned officers, selected from each regiment, topographical sketching and itinerary work, preference being given to those who desire to remain in the service.

The graduates of a cadet military school are usually possessed of the theory of military art joined to an excellent technical education in topography, but lacking practical instruction in minor tactics, for which time and opportunity are not usually available, it cannot be expected that immediately on graduation, these acquirements will fit them for map reconnaissance in an active campaign. The special aptitude demanded is the prompt appreciation of topographical conditions which affect the particular tactical object to be attained; hence, the necessity for thorough instruction in the field, in time of peace, in the details of minor tactics which teach the relations of terrain to tactical operations. Even a verbal report unaccompanied by a sketch, but made by an officer having this prompt appreciation, would frequently prove of more value to a commander than a highly finished map constructed by one not possessed of it. Faithful representation of ground, prompt execution and careful finish are not all the requisites. Prompt execution is very essential on account of the limited time available; but, to be most useful, practical work in minor tactics is needed, that attention may be called to those points, lines and positions which determine the tactical importance of the entire terrain, and that a valuable report may be turned in to the commander. An officer on this duty should know what to omit, and that embellishments not only cause a waste of time but actually injure the map by obscuring important details. Napoleon, who had a well-organized topographical corps, did not require that work turned in should be very exact, but that important errors should not be committed; that the task should be promptly performed; and that there should be sufficient data on which to base his general operations. When time was very short, verbal descriptions only were required, from which sketches were subsequently made.

Many battles have been lost by lack of proper appreciation of this subject, by not taking proper means for becoming acquainted with the terrain of the battle-field. This importance is increasing with progress in the development of tactics, and is equally felt by all the participants, from the commander-in-chief

to the officer in charge of a patrol; and it is most necessary that such rules and regulations shall be adopted and enforced as will prevent any neglect of this extremely valuable part of a military education.

V. MEANS FOR ACQUIRING A PRACTICAL KNOWLEDGE OF THE SUBJECT.

(a) *What foreign armies are doing in this respect.*

The new infantry drill regulations for the English army provide for a course of company field training which has for its object the cultivation of the "eye for ground," and prescribes among other details of instruction the following: "The tactical deployment of the company in action; movements in battle formation on a road, a plain, and in an enclosed country; the attack and defense of a position, a defile, and a wood;" the several movements of skirmishing and of attack formation "to be practised first in detail, and then on varied ground, *the object of each being pointed out*" (the italics are the writer's). In addition to practice in the construction of hasty intrenchments, the "elements of defense of posts to be explained on the ground, where facilities exist, comprising improvised obstacles, the principles of the defense of banks, hedges, ditches and walls. Security and information; conduct of the advance guard on a road, a plain, entering a village and approaching a defile;" and similarly for the rear guard. After an explanation of the object of reconnoitring, comes the field exercise in it consisting of "reconnoitring a defile, wood, village and river; ordinary patrols by day and night, in close and open country; flanking patrols, surprises and ambuscades." The details of outpost duty, including positions of the sentries and pickets with reference to the ground, and preparation for their defense; this practice also at night. All the details of camp life to be taught practically. All ranks are instructed, every available officer, non-commissioned officer and man, with the exception of soldiers of more than 17 years' service. Every company is required to undergo one-month per year of this training, and during that month leaves, and furloughs are not granted to its members. The scheme for each exercise is based on a definite supposition carefully prepared beforehand, and, having first been explained, is carried out as far as possible, under the conditions of actual warfare. To

insure thoroughness of instruction, a searching field examination, the details of which are prescribed preferably by a general officer, is held at the end of the course by the battalion commander, who also furnishes his opinion in writing as to the zeal and ability displayed by each officer; and the general officer is also required, when circumstances will permit, to be present at both the training and examination, to supervise and test the merits of the former, and, in the latter case, that he may better be enabled to add his "own opinion as to efficiency of the officers concerned and their qualifications for promotion."

During the field manoeuvres, for which large bodies of the regular army and the militia are annually assembled, the exercise in attack and defense are devoted largely to inculcating a clear and comprehensive knowledge of the terrain in its relation to the prescribed operations.

In the Italian army, company drill in the attack formation is based upon the principle laid down "that it is far better to work so as to suit the ground than to seek to maintain regular and symmetrical formations;" "and that no symmetrical formation has a chance of success which is not simple and will not bear that mingling of men, which is and must be incident to every advance over rough ground, especially if the advance is in extended order." The first object sought on the offensive is "to feel the enemy and get acquainted with the ground and the state of affairs. In the advance to the attack, cover is to be used when available; on open, level ground, the men are to throw themselves down at the end of each rush;" the number of ranks and the intervals between files in the line of supports to correspond in extent to the nature of terrain,—the more open, the less the number of ranks and the greater the interval.

The fifth paragraph of the German drill regulations is as follows: "Training on the drill-ground must be supplemented by frequent exercises on all kinds of ground. When the condition of the fields make such exercises difficult at the more favorable seasons of the year, then the late autumn and the winter must be utilized for this purpose;" and it is further prescribed that exercises of small commands united so as to form one of full war strength, are to be carried on in the country as well as on the drill-ground at all seasons of the year.

The autumn manoeuvres of the German army have for a special object the instruction of different corps in adapting their

dispositions for attack and defense to all kinds of ground. In observing these exercises, the writer was strongly impressed with their close semblance to actual warfare. Beginning early each day, when two corps of a strength of about 20,000 each are assembled in their assigned positions, all the details of a pitched battle succeed each other and without cessation until the recall at 3 P. M., when the different commanders are assembled and their respective dispositions criticised either by the emperor or a general officer designated by him. The movements are characterized by vigor and energy; special attention is given to the proper selection and occupation of ground by all arms, and particularly by the artillery that its effect may be the greatest possible.

France, Russia, Austro-Hungary and Italy, as well as England and Germany, have their yearly manœuvres, which cannot fail to increase the efficiency of their armies in adapting their movements and tactical dispositions to the terrain.

(b) What our army is doing in this respect.

It would not be just to say that our army has been entirely idle in this respect, and that at the different posts "order arms" and "carry arms," "fours right" and "right front into battery faced to the rear" have been the invariable rule and the limit of instruction; but it is not very far from the truth. To be sure there has been target practice besides, most thorough in itself, but that this exercise, where facilities existed, has been accompanied by instruction of the men in taking advantage of the ground while performing it, is not believed to be the case. The proper use of the ground in this respect is, by the way, an important part of the course in the principal foreign schools of musketry instruction.

The field manœuvres of comparatively large commands which took place in 1889, were very instructive, and it may be safely said that many of the participants learned more in regard to the proper disposition of troops in reference to the terrain, and which would prove of value in war, than they had previously acquired during their entire service.

Indian scouting and campaigning is a special branch of military art, in many respects distinct from any other, and, like all other branches, requires much practice to acquire proficiency. In this occupation, in which fleetness of foot is a special requirement, the troops receive a most thorough training in marching over all

varieties of country, and at times undergo extraordinary privation. Encounters which have taken place between the troops and Indians, when the former were under a commander experienced in this kind of warfare, have usually shown throughout the contest a marked ability on each side in taking advantage of the element of terrain; probably the only exception of note during the past twenty years, on the part of our army, being the Modoc campaign and the battle of the Rosebud. In the former, there seems to have been a lack of appreciation of the full defensive power of a natural fortification of such extraordinary strength as that which the Modocs held; and in the latter, the annihilation of the command was probably due to a want of knowledge of the ground held by the Sioux, and which enabled them to surround the troops, rather than to tactical movements which had hitherto proved unsuccessful.

It cannot be safely predicted that Indian wars have ceased in our country; hence, if for no other reason than to save the hundreds of lives which might again be sacrificed under similar conditions, it is obligatory upon all who may have these lives in their keeping, to make a careful study of the element under consideration, both as to its bearing in Indian warfare as well as in contests with civilized nations.

(c) Instruction.

To ensure the successful accomplishment of a given task, the facilities afforded must be adequate; and, when these are not available, great care is necessary in selecting from such sources as are available those which shall the most nearly ensure success.

In studying the relations of terrain to military operations, experience in actual warfare is undoubtedly the best instructor; but its cost makes it entirely out of the question. Next in value and in logical sequence is its study under those who have had this experience, and who are able to impart their knowledge, the instruction to include practical exercises having as close a semblance as possible to actual warfare. The third in order is instruction by those who, although inexperienced, continue to be careful students of facts as well as theory, and who likewise can describe what they have learned, to be also accompanied by practical exercises. Failing in these methods, the alternative is attentive reading of standard works on military art, including grand and minor tactics, illustrative campaigns and battles, joined

with an endeavor to realize, as far as possible, the effect of configuration of ground in modifying various conditions of the different operations described, and such practice as may be had in military topography.

Except on special occasions when a considerable number of troops is assembled, as during the manœuvres of 1889, it would be difficult to have pertinent illustrations of the principles of strategy; but at every army post, where at least two arms of the service are stationed, field exercises in both grand and minor tactics may be had; and at all the posts, the latter subject can be drawn upon as a never failing source of most valuable instruction and of endless variety; and, aside from the benefits to be thus derived in the exercise of the proper adaption of troops to the terrain, it would, as a means of discipline, serve to arouse interest in the profession where the monotony of adherence to drill regulations alone would tend to destroy it.

It is possible that the proposed new drill regulations may when adopted be modelled in its prescriptions upon the plan accepted as a necessity by the military nations of Europe, and contain such exercises only as may be needed in actual warfare; if so, then it will serve in combination with minor tactics and efficient instructors, to place our army in such a condition, in regard to this vital ingredient of a professional education, as shall enable us to compete on at least equal terms with any foreign army that might be brought against us.

It is astonishing what little value theoretical instruction may have when unaccompanied by practical illustration. Two instances will show it, and in each the officer charged with the tactical dispositions had passed through a thorough course of theoretical instruction in minor tactics. In the formation and disposition of an advanced guard in a country easily practicable and well adapted to surprises, no other precautions were taken to guard the flanks of the columns than the flanking patrols, 150 yards on either side of the route as is customary in open country; and, in the other case, a cavalry charge, beginning at 350 yards from the enemy, was made along a narrow road upon a relatively equal force of infantry occupying the near edge of a ravine which intersected the road at right angles, and whence a direct and oblique enfilading fire was had upon the approaching column. It is presumable to suppose that the criticism made by the instructor at the close produced a salutary and lasting im-

pression which long study of the text had evidently failed to do. It is evidently far better that such lessons should be learned during a course of instruction than in a campaign, at great sacrifice and at the risk of imperilling the safety of the entire army.

As to the kind of practical instruction needed for the army in order to acquire a knowledge of the subject; the different formations and movements prescribed by drill regulations, which, aside from exercises pertaining to ceremonies, are here presumed to conform to the needs of war, are to be practised so far as possible under all conditions and circumstances that are sure to be met with in active operations. Facility in assuming the necessary formations being first acquired on the drill ground, the troops are then to be conducted, in front attack and changes of direction, over all varieties of the terrain that are likely to be met with in the different phases of battle, and each unit carefully instructed how to take advantage of them for cover and to reach the enemy. By the employment of two parties representing the assailant and defender respectively, and causing them to change places during an exercise, the advantage to either of certain peculiarities of ground and of the dispositions required to suit them will be more fully appreciated. The proper handling of supports so that they shall, by taking advantage of the ground, be nearer the main line and therefore the sooner available, is of special importance.

These exercises should actively include all present, and in such manner that each shall be usefully employed and have a well-defined object in view; and should be sufficiently deliberate to afford time for appreciating the value of the different positions. As the men of our army are now composed of a more intellectual class than heretofore, the instructor should clearly explain the reasons for each special formation or disposition, in order that the necessity for it, or for any special exertion on their part in a particular case, may be apparent and tend to increase their interest. Throughout the exercises, command of the troops and order must be carefully maintained; to which end, the drill regulations must be adhered to, so far as the nature of the terrain will permit.

The great value of these exercises lies in the cultivation of individual judgment, of skill, and of a habit of quick decision in adapting troops to the terrain, and in promptly estimating the

relative values of positions and seizing those that are of vital importance to success.

The remarks heretofore made under "Fire effect" are sufficient to show the value of combining instruction in firing, whether individual or collective, with a study of its relations to configuration of ground; and the following from Mayne's "Infantry Fire Tactics," and which are the views of excellent authorities, indicate the kind of instruction desired for the effective use of small arms.

To secure a good fire effect, the men having been taught "to adjust their sights and fire quickly while aiming fairly well," the officer in command must necessarily understand how to control the fire to the best advantage; a qualification requiring practice "on varied and, if possible, unknown ground."

"Let us use fewer cartridges in training men to attain accuracy of individual fire, which has not in war the great importance usually attached to it, and make use of them rather in teaching the leaders the employment of fire." (Simonds.)

"Field firing proper on varied and hilly ground is of the greatest value of all, as it accustoms men more to the realities of war than anything else; it also affords instruction in inclined fire."

"The considerable influence that the form of the ground exercises on the effects of fire, imposes upon all armies the duty of exercising its infantry on all kinds of ground, and not, as is generally done, on flat ground alone." (Brialmont.)

"Field firing, when properly carried out, is worth all the rest of the musketry instruction put together."

It is not here intended, by the above quotations, to belittle the intrinsic value of extreme accuracy of infantry fire, for evidently, if it could be combined with proper adaption to the ground, the result would be perfection; besides, a few men are needed as sharp-shooters; but it is generally recognized as the result of experience, that it is impracticable on the battle-field to continue target practice as elaborated on the range. A fair degree of accuracy only is attainable; multiplicity of details in sighting, if insisted upon, would not only seriously delay but confuse the men; moreover target practice as taught, independently of governing conditions of terrain, would frequently prove ineffective. True appreciation of distances and a knowledge of how to adapt fire to the configuration, especially on the part of

the officers ; and a fair degree of accuracy joined to exercises in which the men are shown the value of these factors, are rational means for producing the required result. In regard to artillery, similar instruction in reference to the ground is needed. As to target practice for this special arm, while not efficient unless accompanied by such instruction, it is usually practicable to employ great accuracy on the battle-field ; time to aim and relative position permit deliberation, and the very long ranges require it. At short ranges, however, as in advancing to the attack or in repelling a charge, inability to aim with much care exists ; hence with accurate target practice should be combined fair but quick aiming, as well as exercises in adaptation of fire to the ground.

"In order that reconnaissances, which now more than ever before are required to examine ground for the determination of relative values of positions, shall fulfill their object, subordinates must be practised in them during peace that they may quickly judge of these values." (Derrécagaix.)

It is not an easy matter to develop, even by practice, the necessary ability for executing a good military map reconnaissance, but facility will come by perseverance. It is not supposed that the student will become expert enough right away to superintend an extensive reconnaissance. It is very essential that he should proceed methodically by beginning with the simplest problems, and working himself up through those of increasing difficulty until he is able to recognize and describe defensive and offensive positions and lines of however complex a nature, to finally include the important features of a field of operations ; and, above all, bearing continually in mind the necessity for rendering an intelligible and comprehensive report of his work.

Practical exercise in it is to be had at every army post, and a certain period could be assigned for instruction under an experienced officer. For cavalry officers, upon whom commanders of armies will in war in great measure depend for special information as to the terrain, extensive trips lasting from one to several days could be made from their posts ; during which time the information required, whether of a general nature, or involving some special hypothesis as to the military situation, would be obtained by sketches and verbal descriptions ; and the work would be subsequently commented upon by the instructor. For the infantry officers, these trips would be of more limited extent ; and if their work is to differ in any way from the preceding, it may be in a

more detailed description of those features which specially affect the use of their own arm. It would be of value to the service if certain non-commissioned officers, or privates, selected for their fitness, should take part in the work. It is easy to see that exercise of this kind clinches the information derived from books, cultivates an aptitude for seizing favorable places for advance and for selecting points to attack, and gives confidence to an officer suddenly called upon in the field for invaluable information; moreover the results of extensive work of this kind are important for future reference at the seat of government.

As standard text books are in general the only available source of information as to the pertinent principles of strategy, some means for emphasizing the instruction are advisable; and to make the lessons of certain value, essays, having for their subjects the concrete application of these principles, as for instance to American campaigns, could be written and then commented upon by an experienced and competent instructor,—the student taking notes of such comments. The interest that is awakened by such a method needs only to be observed to be appreciated. In these studies the important topographical features to be considered are now; first, those which form or in any way affect the principal lines of operations, special attention being paid to railroad centres and fortified places, which, after the enemy's principal masses, are the objectives in a campaign and assure freedom of communication;—then the intermediate and transverse routes; and, finally, the accidents of ground and military positions; and on the defensive;—"the great lines of invasion, which usually correspond to the principal railroads; the main routes entering the territory in less dangerous directions; the ordinary roads in hilly sections; defiles, necks and passes on the frontier, which might enable the enemy to turn certain defensive positions; and, in the interior, the important railroad junctions and the defiles traversed by the main railroad lines." (Derrécagaix.)

In grand and minor tactics and military topography, theory should be joined to practice, in order to make the instruction tangible and of a real value, and to impress with a thoroughness that cannot admit of doubt the relations of terrain to military operations.

Among the best works on grand operations, which include the present subject illustrated by examples, are Clausewitz "*On War*," Hamley's "*Operations of War*," and Derrécagaix'

"Modern War,"—representative works of the three great military nations; and on minor operations, Shaw's "Elements of Modern Tactics," and Clery's "Minor Tactics." These with Home's "Précis," Von der Goltz' "Nation in Arms," Von Scherff's "A Study of New Infantry Tactics," and Boguslawski's "Tactical Deductions," contain most valuable information pertaining to the present subject. In "Battles and Leaders of the Civil War" are very pertinent examples, and the "Official Records of the Rebellion" are replete with apt illustrations, which can readily be sifted out and arranged for students' use.

CONCLUSION.

The importance of the subject cannot be too strongly impressed. There is hardly a general principle of either strategy or tactics, or an order that is given by a commander-in-chief distant from the place of execution, which does not require some modification due to the nature of the terrain; and the proper application of the principle or execution of the order must then depend upon the ability of the commander present with the forces to adjust his tactical dispositions to suit this requirement.

The importance which Napoleon attached to a clear and accurate knowledge of the terrain is evidenced in the fact that, previous to the execution of a plan of operations, he entrusted the examination of territory to his most eminent general officers; and his instructions as to the proper mode of conducting it are well worthy of careful study. Von Moltke also, in a few years immediately preceding the war of 1870, made it a special duty to gather more detailed information of the French territory than was contained in the latest topographical maps; his emissaries traversed the entire region for this purpose, and the result of this work was that "portfolio of maps," which enabled him to make his combinations and dispositions so near perfection.

The German and French armies from their experience in 1866 and 1870 respectively, recognized the fact that their training in adapting battle formations to the terrain had been very deficient, and that radical changes were needed to correct the fault; and there are few officers now living who commanded troops in our Civil War that cannot, from their own experience, recall instances when, in the execution of their plans, inattention to the effect that some peculiar features of the terrain would produce, led to disastrous results; and on the other hand, when a proper value

had been attributed to it, that this element alone, and not infrequently, decided the victory in their favor.

The progress now making in military art, the remarkable improvements in the effect of fire-arms, the employment of larger armies and the consequent need of greater skill in handling them in marches as well as on the field of battle, so that mistakes of conduct shall be reduced to the narrowest limits, make paramount the cultivation of that discernment which enables not only the most favorable time for acting to be selected, but also the most advantageous place for its performance.

Decision, common sense and the knowledge of governing principles and how to employ them are the qualifications of the consummate tactician; practical exercises develop these qualifications; and, in applied tactics, where the judgment is continually exercised in determining proper dispositions for attack and defense as governed, on the one hand, by regulations in which relative positions and distances are laid down with more or less exactitude, and, on the other, by modifications thereof required by the nature of the terrain, is found a field most useful and effective for their development; and practice, in which the handling of troops and study of the relations of terrain to military operations are joined, will invariably lead to the most perfect tactical dispositions.

NOTE.—In the preparation of this essay all available sources have been resorted to for information, among which may be mentioned:

Battles and Leaders of the Civil War.
 Baden Powell's Cavalry Instructions.
 Boguslawski's Tactical Deductions.
 Clausewitz on War.
 Clery's Minor Tactics.
 Derrécagaix' Modern War.
 Drill Regulations of Different Armies.
 Von der Goltz' A Nation in Arms.
 Von Hohenlohe's Letters.
 Home's Précis of Modern Tactics.
 Jomini's Art of War.
 Marryat's Field Training.

Mayne's Infantry Fire Tactics.
 McClellan's Own Story.
 Memoirs; Grant's, Sherman's and Sheridan's.
 Pratt's Field Artillery.
 Shaw's Elements of Modern Tactics.
 Von Schellendorf's Duties of the General Staff.
 Trench's Cavalry in Modern War.
 Unger's Reconnaissances Militaires.
 War of the Rebellion Official Records.

A UNITED STATES ARMY.*

BY LIEUT. JOSEPH B. BACHELOR, JR., 24TH U. S. INFANTRY.

"Ready, aye ready."

"THE prophets are dead," without heirs. The inheritance of their powers is falsely claimed by those who delude the people with dreams of universal peace ;—

"Where the war-drum throbs no longer, and the battle flags are furled
In the parliament of man, the federation of the world."

But with five great wars in the last forty years we need not look for the speedy coming of any such millennium ; and without prophecy we can never be certain when war may come again. The day of champions and paladins is over. No modern Samson will arise to judge the people and slay a thousand of our foes with the jaw-bone of an ass ; though the same weapon wielded by partisans in a warfare of words may leave us naked for a sterner war, and thus send tens of thousands of our brethren to death. Victories will still be won by heroes, but by heroes directing their united efforts in the paths which laborious training has taught them to follow.

With each succeeding year, as the struggle for individual and national prosperity grows more intense, the causes of war grow more numerous, and its danger more imminent. We cannot say when it may come, nor whence. There is reason for apprehension in more than one direction. England, France and Germany, all have given us cause and received cause from us to complain of unfriendly treatment ; who can tell when issue may be joined in the only court where national redress can be sought ?

If a deficit in the budget of any European power should make it worth while to extract a few billions from us, it will hardly be supposed that a pretext would be wanting or that a sentimental fondness for peace would prevent its leaders from attempting to fill its treasury with our money ; or if England, for exam-

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ple, saw our commercial flag likely to drive hers from the seas, she would hardly hesitate to reverse the process with gunpowder. History does not read that way. Our combination of wealth and weakness (sixty billions without a gun to guard it) increases the danger and emphasizes the necessity for protection, until both should be evident, even to the believers in peace on earth.

To the south lie rich countries towards which the covetous eyes of Europe have already been turned. The attempt of Maximilian failed; but are we ready to conclude that others will share its fate, without our intervention? We cannot allow these countries to become colonies of Europe; but "reasonable stability of institutions is necessary to commercial intercourse with them, and to the peaceful development of their resources by the citizens of more stable governments." If this need cannot be supplied by themselves "no theoretical position, like the Monroe Doctrine, will prevent interested nations from attempting to remedy the evil by political and, presumably, forcible interference, and that nation will have the strongest argument which has the strongest organized force." Thus, from the development of commerce, we may anticipate collisions of interest "which can scarcely fail to result in war." *

If this were not enough, we have practically challenged the world to arms. We are cutting a canal across Central America by which we can and will control the commerce of half the world. When M. de Lesseps cut the Suez Canal, its neutrality was the subject of international conference; its control has been the subject of diplomatic scheming; and its defense is now one of the chief objects of military activity in England. No nation, with its allies, is strong enough to hold sole possession of that few miles of waterway; yet we propose, with our force unorganized and undeveloped, to own in fee-simple a canal many times more important to commerce than the Suez. When completed, we must defend it; the necessity will surely arise and it behooves us to be ready.

Our first century was spent outside the arena of the world. Remote in position, without great local accumulations of wealth, without complications of interest, we lived our quiet youth. Now steam has brought us close to Europe. Now cities near our frontiers, great centres of our business nerves, offer to an enemy vul-

* "The Influence of Sea Power."—Mahan.

nerable points which paralyzed, would paralyze our prosperity. Now we are likely to become, and in fact must soon become formidable competitors in every market with the great trading nations. Now we have interests abroad which are endangered by threats of aggression far from our own borders, and no question can excite Europe without agitating us.

Twenty years ago we still had a vacant domain comparable with that shared by Alexander's captains when they parcelled out the world. Now we learn that nearly all our arable public lands have been occupied, and the population which has thus been accommodated must hereafter be provided for otherwise. With the crowding of the people must come dissensions. We have imported not only the best of Europe but the worst, and already we have heard threats of anarchy and wholesale destruction in our midst. These dissensions and threats we must be ready to meet, remembering that no matter how long civil law and civil process may suffice for the control of evil doers, the ultimate sanction of law is force.

There is no danger of our national extinction, by conquest or otherwise; but there is danger of national humiliation and of such loss of property as would far outweigh the cost of timely reparation. Fighting is part of man's nature and, sooner or later, we must fight. The question for our leaders to consider is whether we shall be ready or unready.

In abundance and quality of the raw material for war, we stand without a parallel. The American possesses all the natural qualities of a soldier. The result of organization, instruction and discipline, added to his self-reliance, intelligence and courage, is the best soldier on this planet. Witness the armies, comparable only with each other, which stood in deadly duel in Virginia, fainting, thrusting, guarding, bleeding, everything but flying. Witness the salient that Thomas held, untenable by any but Americans, and the heroic dead who fell in vain assault upon the "Rock of Chickamauga."

If untrained valor were the only requisite for military success, the desperate fanatics of Abu Klea would not have left an Englishman alive, and 400,000 patriotic French levies, fighting for all that man holds dear, would not have surrendered their "Beautiful Paris" to half their number of trained German troops. We are over-confident. Remembering only that we have shown our capacity for war and our essential strength, we are prone to for-

get the disgraces of 1861 in contemplating the glories of 1863 and 1864, and to believe that a raw levy would equal the soldiers of Gettysburg, because the material would be the same, forgetting that the training they had received was part of those soldiers. That training we absolutely lack, and will never receive until the lawgivers provide the means; and the means, when provided, must be suited to our institutions and the genius of our people. We cannot copy other models.

In theory, every citizen is at need a soldier. Any one who thinks this theory true in our country has only to remember the bounties offered during all our wars, and the draft riots of 1863, when troops were sent from the seat of war in Virginia to the seat of war in New York. Let us not be led by admiration for successes gained under such a system to imagine that a free people would submit to universal military service. We could hardly enforce such a system, even in war; we certainly cannot enforce it in peace; and peace training is just what we need. It is a costly process to begin the instruction of the soldier on the battle-field.

The regular army is so small that its numbers are scarcely believed by our own people. It is hardly inaccurate to say that we have no army. To supplement it we have the militia, the volunteers and the men who may be drafted or conscripted when the need arises. The last class need only be mentioned; they must get their training as best they can.

The militia exist only on paper, or rather, in idea. The only law touching them requires the officers to be armed with a "spontoon" and the men to be provided with equipments which no one in this generation has ever seen outside of a museum. The law is obsolete, and the militia non-existent.

There are, in most of the States, organized volunteers, calling themselves National Guards, with the addition in many cases of local designations. They are not militia, for they do not exist under the militia law, nor are they subject, by virtue of enlistment, to the orders of the President. They are State troops, recruited by voluntary enlistment, supported, uniformed and equipped by the State, and, though the arms generally come from the General Government, really armed by the State. They receive privileges or pay, or both, from the State, and, in short, are little State armies, lawfully available for service only within the State. They not only exist without warrant of Federal law,

but in direct contravention to the Constitution, which provides that "No State shall, without the consent of Congress, keep troops in time of peace." (See Cooley's Constitutional Law. Liability to enrollment in the militia, even when the performance of military duty is superadded, does not make a man a militiaman, unless he is actually enrolled, according to the Constitution and the law.)

It may be thought that the action of Congress in making various loans to the National Guards, and especially the fact that the Adjutant-General annually reports their numbers, constitute a tacit consent of Congress; but this would hardly be seriously maintained in view of its consequence, that any State is now thus authorized to raise any number it sees fit, and to maintain and employ them as it pleases.* There is no doubt, however, of their value, no fear of their improper use, while in many cases their drill, for parade purposes, is excellent. Legalized, organized and disciplined by the United States, they would form the framework of an army moderate in cost, imposing in numbers, splendid in material and ever ready for our defense.

The National Guard now numbers about 106,000. The average strength of their companies, on paper, is about 50 men. The number available for duty would probably not exceed 50 per cent. of the paper strength. They are the means by which our practical people, feeling the need of some form of armed protection, have striven to remedy the neglect of Congress to provide that protection, and represent the result of their unaided efforts. If the aid of the Federal Government were extended to them, the same military spirit which, unassisted, has maintained 106,000 volunteers in violation of the law, would raise and maintain many more pursuant to the law.

Should they be increased? A practical example may answer the question. The defenseless condition of our sea-coast cities has been more than once described, and is known, though the knowledge moves small interest among the people, whose interests are most involved; but besides these we have others whose exposure has been little considered.

Along our lake frontier lie the cities of Buffalo, 255,664, Cleveland, 261,353, Detroit, 205,876, Milwaukee, 204,468, and Chicago, 1,099,850, with an aggregate value in real and personal property of more than \$3,500,000,000.

* New York, for instance, to arm her available force of 640,000.

The Secretary of War in his latest report says: "By our agreement of 1817 with Great Britain, each party is restricted to a single armed vessel on Lakes Ontario and Champlain, and two on the upper lakes. Since then the great West has become an empire of production and population, with its great cities, centres of wealth, commerce and transportation, built on the straight shores of the broad lakes and defenseless against naval attacks. The Welland Canal and the six canals along the St. Lawrence between Lake Ontario and Montreal have been constructed and are wholly in foreign territory. The smallest of the St. Lawrence canals has nine feet depth of water and locks 200 feet long and 45 feet wide, sufficient for the passage of over 50 of the armed vessels of the British Navy. Measures have already been commenced to enlarge the smaller canals, so that none will have less than fourteen feet depth of water, which would admit the passage of as many more of a heavier armament.

"In the absence of any preparation on our part the lake cities might, in the event of war with the power holding the highway of the St. Lawrence, be in a more defenseless condition even than the sea-board cities. Although we cannot, under the agreement, build armed vessels on the lakes, to overmatch on those waters the force that might be brought against us, I do not think it necessary to undertake any elaborate system of defenses. With land forces properly disposed, we could doubtless ward off any danger from this source, and hence I fully approve the suggestion of General Schofield, who, of this subject, says:

"The military policy of the United States in that direction will not, it is believed, in any conceivable event, require such defense on that frontier. It is proposed to maintain at suitable points, which have been carefully selected, suitable garrisons of regular troops of all arms, as nuclei for the concentration of such forces regular and volunteer, as any emergency may require in that direction. * * *

"Proper preparations are not measures of provocation, but rather of prevention and for the continued preservation of peace."

There may be a doubt whether it is wise and prudent to neglect the fortifying of these points, but there can be no doubt that the policy of maintaining nuclei is not only wise but necessary. Given the nuclei, where are the troops "which emergency may require"?

On paper New York has 13,000. An emergency might bring 8000 to the field, and of these at least 5000 would be imperatively demanded for the defense of the city of New York, which would be in danger before the northern border was threatened; leaving 3000 for the defense of Syracuse, Rochester and Buffalo. These might concentrate around the following nuclei:—6 companies of infantry at Madison Barracks, 2 at Fort Niagara, 2 at Fort Porter, 1 at Fort Ontario and 1 at Plattsburg Barracks; in all, about 600 infantry.

Ohio, with Cleveland, Toledo and Sandusky undefended, has nominally 5000. An emergency might bring 3500 to the defense of these points, but they have no nucleus.

Michigan, to cover Detroit, has 2000 on paper and might muster 1500 for the field, with a nucleus of four companies, about 200 infantry, at Fort Wayne.

Wisconsin, having 2000 on paper, might bring 1500 to defend Milwaukee. There are no regular troops in the State.

Illinois counts 4000 of the National Guard. Fort Sheridan will soon be completed, and will have a "large" garrison, perhaps as many as 700 regular troops; so that, if no call for defense came from the rest of the State, and if 75 per cent. of the paper strength could be relied on, Chicago, with a population of more than a million, might at need count on 3700 defenders, 3000 well drilled, and 700 well disciplined.

No account is taken of reinforcements to be sent from one part of this frontier to others, because no such movement could be made. Even if we were warned by declaration of war, or sagacious enough to foresee an attack, the point where it would be made would be in doubt, and the available forces, under popular pressure, would be distributed among all the threatened points. The National Guardsman, believing his own home endangered, would not leave it to go to the defense of some other home; nor could an order be lawfully given by the President, because the National Guards of the States, as such, are not subject to his orders; while the order of the Governor would be binding only for service within the State.

Of course we may never have war with England, but it is always possible so long as she has interests which may conflict with our rights. Malta is a perpetual record of her readiness to violate every pledge in pursuit of her advantage. Her contempt for the rights of others may be seen throughout the world. The

dominion of India, the mainstay of her empire, was gained by a combination of commercial and political intrigue and usurpation unparalleled in history. She forced the opium war on China to increase the profits from India, by extending the market for one of India's chief crops, and in violation of the dictates of generosity, justice, humanity and decency continues to fill her coffers with the very bodies and souls of Chinamen, coined into English guineas. We may expect armed aggression whenever England thinks it will pay.

The deepening of the Saint Lawrence canals, just referred to, may have only a peaceful significance. It may not have occurred to any Englishmen that they might furnish a ready means of evading the treaty of 1817, and of attacking us at advantage; but they might be so used, and we should remember that England claims the right to destroy our seal fisheries in Behring Sea, and to exclude us from the cod fisheries of the North Atlantic, and that the correspondence has not been entirely pacific. War is always possible when nations disagree. Having accumulated so very many millions in our treasure-house, we ought at least to think of putting a lock on the door.

We do need an increase in the National Guard and a change in its status which will make it available for National as well as State defense, and the means is to be found in National aid.

There are some conditions, however, which must be fulfilled by any legislation for that purpose. There must be no provision which will arouse the jealousy of a free people towards standing armies. Hence the elements of our new force, drawn from the people, must be left in and among the people. They must not be made a class apart, which the feelings and thoughts of the people can but feebly influence. Nor can they, for any considerable time, be withdrawn from the army of industry where they are now serving. The requirement of any duty which will seriously obstruct business will at once defeat the purpose of the law, for the first consideration of the American is the earning of his living. All unnecessary restrictions must be avoided, as for instance on changes of residence. Caution should be shown in lessening the right which now exists of electing the officers; indeed, the choice of company officers may well be left in the hands of their men, with full confidence that the choice will seldom be wrong. The term of enlistment should not be long

enough to become a burden, and property accountability should be lightly imposed.

The National Guard should be legalized. It is a dangerous necessity which impels a law-abiding people to break the fundamental law, and in this case the necessity should be at once removed. When legalized they will become part of the military establishment of the United States; not of necessity, for with the consent of Congress the States might continue to raise and support them, but because no Congress will ever give any such consent. What their exact status and designation will be is immaterial. They might well be left under the name they have chosen, and to which they do honor—The National Guard.

Their recognition by the United States will not withdraw them from State control, under which they now stand as a bulwark of law and order, but superadd to this the control of the United States. This principle of concurrent authority is familiar. The Constitution (Art. I, Sec. 8) gives to Congress the "power to provide for organizing, arming and disciplining the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the States, respectively, the appointment of the officers and the authority of training the militia according to the discipline prescribed by Congress." It is to be observed, however, that the National Guard, if legalized and organized as here proposed, will not be militia. Preserving their present relation to the States they will form a new relation to the United States, and will become part of the military establishment of the Nation.

The time and manner in which these forces shall be employed should be defined by the law. The officers of the United States charged with the execution of the provisions for their organization and instruction should act under clearly defined statutory powers, ample for the discharge of their duties and the exercise of their proper authority; but that authority should go no further than is necessary for efficiency.

We deny the theory of universal liability to military service by neglecting to train the people in any degree for such duty. In order to create a force for our defense, we must offer some inducement to the citizen to enrol himself in that force, since we do not and cannot enrol him therein. Of course Congress could pass such a law but it would be repealed at the next session, and every Senator and Representative who voted "Aye" on its pas-

sage would be relegated to the shades of private life at the next election. The clearest, easiest and cheapest inducement is a subsidy. We have granted subsidies without number for all sorts of purposes; surely, we may grant one for a purpose which may at any time become essential to our national safety.

The bounties paid during our late war were subsidies. During that war the bounty rose as high as \$1500 per man, and the total paid was more than \$700,000,000. The "bounty jumper" abundantly proved that the subsidy in that form does not secure the best military material; while a subsidy for the National Guard would secure just that material, and would maintain in constant readiness ten army corps at less cost than 2 per cent. of the bounties of the war.

Grant and acceptance of the subsidy must establish the right of the United States to command at need the services of the identical men by whom it was received. If the grant were to the State National Guards, without change in their present status, the requisition for troops, in emergency, must still be made on the State, which, instead of those trained and disciplined by means of the subsidy, might at its discretion furnish raw recruits, after such a delay as would make the best soldiers come too late. The Revolution and the War of 1812 ought to give sufficient warning not to trust to requisitions when we need soldiers.

Grant and acceptance should make the grantees part of the land forces of the United States. We cannot force it on our people. Attempts to ape the German system of universal service have been proposed because under it the Germans organized victorious armies, but in this country the proposition, if noticed at all, would excite a mixture of rage and contempt. The enlistment or quasi-enlistment of every man in our forces must be voluntary; but when the aid of the United States has been accepted military allegiance must follow, and the order for service, properly published, must be as binding on the National Guard as on the Regular Army.

In the National Guard of the United States the cavalry and artillery arms should be paid more than the infantry; in justice, because their expenses are greater; in expediency, because they take longer time to train, and therefore need peace training more. The scale might be somewhat as follows: for each company of infantry accepted, \$1000 per annum; for each accepted troop of cavalry or battery of light artillery, \$5000 the first year and

\$3000 each year thereafter; provided that each troop and battery shall be properly horsed at the end of the second year.

The question at once arises, "What companies, troops and batteries should be accepted?" Training being the end in view, could not be a prerequisite for acceptance; yet some guarantee should be given of genuine interest on the part of officers and men. It would be sufficient to require that each company should have not less than sixty men regularly enrolled, should have held a regular election of officers at least two months before the date of muster, and should have had one drill per week for the two months next preceding that date, at which the average attendance was not less than 50 per cent. of the whole strength, except in towns or villages of less than 5000 inhabitants, where $33\frac{1}{3}$ per cent may be sufficient for acceptance.

The application for enrollment in the National Guard of the United States should come from the company. On receipt of such applications from troops in any State equal to the prescribed minimum, it should be the duty of the Secretary of War to detail from the Army an officer to report to the Governor as inspector for that State.

Officers on that duty will exercise, under the direction of the Governor, a general supervision and control of the National Guard, inspecting them as directed, and making suitable returns both to the Governor and the Adjutant-General of the Army. Twice a year will be often enough for the inspection, and the returns might be limited to muster rolls and reports of proficiency. On approval of the condition, drill and general efficiency of the company, having present the required number of men, let the inspector certify the account for the subsidy, which shall be paid by the designated authority when duly presented, with a copy of the muster roll attached.

Each man, by signing the request for enrollment and afterwards the muster roll of his company, contracts full liability to service when called on; but the unit with which the United States deal is the company. It is the company that is paid, and each receives the same subsidy as long as it comes up to the standard.

As companies are accepted they should be formed into battalions, regiments, brigades, divisions and corps. No hard and fast rule can be laid down for these organizations. They should be formed as rapidly as possible, under the orders of the Presi-

dent, and the suggestions of the State authorities should carry due weight. The command of divisions and corps should be left vacant; indeed, the only reason for forming these is the need for a system of supply, spoken of later. Normally, a regiment should consist of three battalions, and a battalion of four companies.

This organization has been adopted by every nation in the world, except Persia, China and the United States, the latter clinging to the present antiquated formation only in the infantry arm. The advantages of three battalion regiments are plain and important, and they should be adopted from the first in our National Guard. When war arises, a fourth, or depot battalion should at once be formed to collect and train recruits, and to forward them, when properly instructed, to supply the losses of the regiment.

The officers elected by each company, and approved by the Governor, should be commissioned by the President in the National Guard of the United States, to serve as such for one year or until their successors are commissioned. The company officers of each regiment should, every two years, submit to the President through the Governor, the names of those persons whom they consider suitable for appointment as field officers,—two for colonel, two for lieutenant-colonel and six for majors,—and of these the President should appoint and commission the field officers of the regiment, to serve as such for two years. General officers should be appointed by the President, giving the weight to the recommendations of the Governors.

This new force, thus organized, must be instructed. The necessity for uniformity is evident, and to attain it we must have a standard to reach, and the means of reaching it. The first condition is fulfilled by detailing officers of the army to supervise the instruction by army standards; to fulfil the second, we must consider what the education of a soldier means. It is not sufficient that the company be drilled, though it move with the proverbial "regularity of a machine." Fine appearance is no substitute for serviceable arms. At the competitive drill in Savannah in 1886, the rules required competing companies to be inspected. Several barely passed the inspection, though it was by no means rigid, and one splendidly drilled company, confident of the prize, was thrown entirely out of the competition by rusty rifles. Many companies in the State National Guards are so ignorant of the

work-a-day aspect of a soldier's life that they could not cook a meal or pitch a tent. In fact, it is said that at one of the great camps of New York, the tents are pitched for the men, and their meals supplied by a restaurant. Such is not the training that fits men for the field. Target practice is practically non-existent. The duties of advance and rear guards, flankers and patrols are unknown to officers and men; while any ideas they may have of attack and defense, of hasty intrenchments, of the power of modern arms and of the employment and control of infantry fire, are recollected from twenty-five years ago, or evolved from their inner consciousness. The teaching they need cannot be supplied in a day, or a year, but it can be supplied in time by patient, persistent effort. They are much more ready to receive than the country is to give it, and the time may soon come when their protection will cause us to realize the wisdom of the giving.

First, as to practical instruction. Require a reasonable amount of drill, not enough to become a burden. Require each regiment to encamp for one week every year, and each brigade for two weeks every second year. Let companies march to battalion rendezvous, and battalions, if the distance be not too great, to the rendezvous of their regiments. Transport regiments to brigade camps by rail. In camp and on the march, require all the duties of soldiers. Let every march suppose a hostile country, every camp be guarded, and imitate the admonition of Scripture, and "he that will not cook, neither let him eat." "More men have been killed by beans than by bullets." Fill the time of the encampment with regimental and brigade drill, practice marches and skirmish firing, and teach by practice the duties of patrol and reconnoissance.

To provide for theoretical instruction in the soldier's art requires such a departure from our traditional policy that the subject must need be approached with diffidence. No tedious lucubrations of a military pedant, no translation of a foreign theory, will meet our wants. We need short, simple books, treating of things which our soldiers want to learn. They can hardly be brilliant with originality, but, while they consider foreign experience, experiments and practice, they must be Americanized. They should be uniform, and hence should be supplied by the War Department. Where shall we find them? They are still unwritten, and will see the light only when they are encouraged to appear by giving some hope to our officers that he who produces a

text book, suited to our needs, on any military subject, will reap a reasonable reward for his labors.

For the enlisted man we need a little volume containing the statute under which he is enrolled, the Articles of War, the duties of sentinels, pickets, scouts and patrols, a simple description of the construction, care and power of his arms, a few hygienic principles, the ordinary expedients for adding to the comfort of camps, and general directions for cooking in the field, for railway transportation of troops, and for care of horses and artillery carriages.

For the officers a broader course of instruction should be provided. Modern formations for attack and defense leave much to the direction of the commanders of battalions and companies. They should be supplied with books explaining these duties, as well as those of outposts, advanced and rear guards, the methods and objects of reconnoissance, the means of supply to troops in the field, hasty intrenchments, the transport of troops, the care of arms and ammunition, and, especially, the employment and control of fire; in short, that great portion of their duties which lies beyond the mere drilling of their men.

So much can be done in a short time, with comparative ease and at small cost, and, combined with practice on the march and in camp, will go far towards military education. Further teaching, however, is needed, and the means lies ready to be used. The School of Application at Fort Leavenworth, which now exists by War Department order only, without financial support, without even recognition in the Army Regulations, and that at Fort Riley, still in embryo, ought to be solidly founded on legislation. Let the law provide that one officer, not above the grade of lieutenant, may be detailed from each regiment of the National Guard, to report as a student, for one year, at the School of Application of his arm of the service, receiving \$75.00 per month as pay during that period. Returning to their regiments, these officers would in turn become instructors, "until the whole was leavened."

The complete success of such schools would demand instructors of more than usual acquirements. The selection cannot be based on geographical distribution, the fact that an officer is serving at a post being small warrant of his value as a teacher. The detail must be a special one, based on special fitness, and a wise policy would give these positions such advantages as would

make them objects of emulation. When an officer is found well fitted for the duty, he should be kept as instructor as long as practicable: the schools should not be deprived of the services of an able teacher without good cause.*

Here again we shall need text books, not translated or imported, but clear, concise and American. To get them, we must give our officers encouragement and opportunity to write them, for lack of any general interest in military subjects removes the ordinary incentive to such labors.

Additions and improvements will follow, until we have great war colleges, not substitutes for, but supplements to the Military Academy, disseminating military knowledge, without burden on the people and within such limits as they will cordially approve. The full results may not at once appear, but the ultimate outcome is sure.

The next question is that of equipment. Not only should each troop, battery and company be equipped with all things needful to take the field at once, but a sufficient surplus should be kept on hand to equip the whole war strength. These articles should be accounted for twice a year by company returns, verified by the inspector and consolidated in his office for each State. Transport may be left, for the present, to be provided for later, but officers should be detailed to examine and report upon the resources for this purpose in each State.

"An army travels, like a serpent, on its belly," said the great Frederick. The limits of this paper do not allow more than a reference to that vital question, the supply of our armies in war. There is no one factor on which success so greatly depends, nor any in which "careful study and forethought will go so far to remove the indeterminate causes which mar the most brilliant plans."†

We are not ready to plan campaigns on all our borders, and to organize every railroad as a possible line of supply; we can only determine the starting point for the supply of each corps.

* It involves no disparagement of his successor, nor any criticism on the authorities to mention the case of Major A. A. Woodhull, Med. Dep't, recently relieved from duty as instructor of Military Hygiene at the School of Application at Fort Leavenworth. It is much to be regretted, for the sake of the School, that he could not be longer left in charge of the important department which he created, and which his talents so eminently fit him to adorn.

† Home's "Precis of Modern Tactics."

The collection of supplies in the neighborhood of an army, though important, will never be sufficient for sustained operations. The true basis lies in connecting each corps with its particular district for supply and for recruits; of which abundant proof can be found in the Franco-Prussian war, in which "The German system, by which corps locally organized were connected with their own districts, thus rendering all Germany the source of supply, came into immediate contrast with the French system, by which troops from all parts of the Empire, without previous association, were brought together, and supplied from fortresses converted into depots for the occasion. So defective was the French system that the divisions of the army were at once separated for subsistence, and in the first marches their supplies and transport failed." In fact, "The want of transport and of provisions had begun to be felt before the organization of corps was complete."*

Supposing the National Guard increased three for one, the corps depots might be as follows:

CORPS.	DISTRICT.	DEPOT.
1.	New England States.....	Worcester, Mass.
2.	New York.....	Albany, N. Y.
3.	New Jersey, Pennsylvania, Delaware, and West Virginia.....	Harrisburg, Pa.
4.	Maryland, Virginia, Dist. of Columbia, and the Carolinas.....	Richmond, Va.
5.	Georgia, Florida, Alabama and Tennessee.....	Atlanta, Ga.
6.	Mississippi, Louisiana, Texas and Arkansas.....	Vicksburg, Miss.
7.	Ohio, Indiana, Kentucky and Michigan.....	Fort Wayne, Ind.
8.	Illinois, Missouri, Iowa, Minnesota and Wisconsin.....	Rock Island, Ill.
9.	Kansas, Nebraska, the Dakotas, Montana, Wyoming, Colorado and New Mexico.....	Omaha, Neb.
10.	Idaho, Utah, Arizona, Washington, Oregon and California.....	Sacramento, Cal.

The carrying power of the railroads should be studied, and schedules kept up to date of the amount of transportation they could furnish. The regular working of the railways is of the first importance; when the occasion arises, some semi-military control of these lines must arise with it, but even in war "the ordinary traffic will not be interfered with for military purposes, except when absolutely requisite."† Here again it must be remembered

* Hamley's "Operations of War."

† The Emperor of Germany.

that the Government does not own the railroads, and that attempts to copy systems which involve such ownership can result only in caricature.

When the National Guard is to be called out, the order will be sent to the State Inspector, who will transmit a copy to the commander of each brigade, regiment, troop, battery and company, designating the time and place of assembly for each. The order will be posted in the armory and at other conspicuous points, and published in all the local papers; and such publication will be legal notice, subjecting every man called out to the penalties which the 33d Article of War provides for those who fail to repair to the rendezvous appointed. The assembling of the battalions will follow that of the companies, and thus the movements of concentration will go on until the army is ready for the field. Meanwhile the depot battalion of each regiment will be formed, supplies and transportation accumulated, and the lines of communication organized.

For such an army as we need in war we must have a suitable staff. This need our present force can but partially supply, nor is any considerable increase of our staff departments at present practicable. The officers of the line have received valuable training in the performance of staff duties at the scattered posts where they have been serving since the war, but the policy of concentrating in large posts is restricting, and will continue to restrict, the field for such training. The regular army is really the general staff of our National forces, however organized or designated. Their opportunity to learn staff duties should not be lessened, but increased; first, by details for those duties with the National Guard, and, secondly, by the establishment of a staff college, or the increase of one of the existing schools to the proportions of a military university, where officers may be sent, on their own application, to study, under thoroughly qualified instructors, those branches of their profession for which they have special taste or aptitude. "Armies grow more complex as society grows more complex, because discoveries and inventions introduced into civil life are adopted into armies, and the standard of knowledge is everywhere higher."* Pluck and dash are as essential as ever to officer and soldier, but they are no longer sufficient. Knowledge must go with them. We have the officers who will learn; give them the means of learning.

* Hamley's "Operations of War."

Two questions remain to be considered: Will the plan here proposed prove efficient, and—What will it cost?

Without claiming any share in the mantle of Elijah, several predictions may be confidently made. Acceptance of the subsidy would impose some additional duties on the National Guardsman; but the present burden would be light, its graver aspect remote, while the immediate and substantial aid would enable him to find more pleasure in the military side of his life. Hence, it would be accepted by most of the present organizations.

Service in the National Guard is now an expense to most of its members. In many cases they get no appropriation from the State, and the uniform and equipments must be bought either by the wearer, or out of a slender fund subscribed by the citizens. This expense, which presses especially on the cavalry and artillery, has prevented many enlistments; hence, when the proposed subsidy removed or lightened it, the strength of existing companies and especially of existing troops and batteries, would receive a marked increase. For the same reason companies would be formed where now there are none, until infantry had increased fourfold, and cavalry and artillery tenfold.

What would they cost? The cost of their arms is not fairly a part of the problem. No nation can seriously contemplate a continued neglect of the means of arming such forces as it relies on for defense, whether it trains them or not; and in spite of the incubus of incapacity and indifference under which we have lain, the adoption of a military rifle must involve its manufacture in such numbers as we shall need. It may therefore be assumed that the arms will be kept on hand, and their cost will not be counted in the present estimate.

Suppose the National Guard increased to 400,000 Infantry (4000 companies), 50,000 Cavalry (500 troops) and 30,000 Artillery (300 batteries), the annual expense would be as follows:

Subsidy for Infantry.....	\$4,000,000	} Includes interest at 5% on organization subsidy.
Subsidy for Cavalry	1,550,000	
Subsidy for Artillery.....	930,000	
Total.....	\$6,480,000	

The cost of instruction includes:

1. Inspection.
2. Target Practice.
3. Encampments, including transport and subsistence.

4. Military works for distribution.
5. Instruction of officers at military colleges.

1. The Inspector should have such pay and allowances as will evidence the importance attached to his position and duties by the United States. Let him be given the pay of Major. This will entail an annual increase for 40 officers from about \$2000 to about \$3000 each..... \$40,000
 Travel, about 5000 miles @ 8c. per mile, \$400 each..... 16,000
 Other expenses (office rent, etc.), \$1000 each..... 40,000

Total..... \$96,000

2. Target Practice :

Infantry, \$2 per man..... \$800,000
 Cavalry, \$1.50 per man..... 75,000

Total..... \$875,000

3. Regimental Camps, one week per year :

Subsistence for 480,000 men @ 25c. per day, 14 days (to include travel)..... \$1,680,000
 Transport, @ \$2.50 per man..... 1,200,000
 Brigade Camp, one week per year.
 Subsistence 11 days (to include travel)..... 1,320,000
 Travel (from Regimental Camp only), @ \$4 each..... 1,920,000

Total..... \$6,120,000

4. Military Works :

Four annually to each company, troop and battery @ \$2.50 each (average)..... \$48,000
 Allowance to Schools..... 10,000

Total..... \$58,000

5. Instruction of officers of the National Guard :

Pay of 330 officers of Infantry, }
 50 officers of Cavalry, } @ \$900 per year..... \$369,000
 30 officers of Artillery, }

Increased pay to 8 instructors @ \$1000 each..... 8,000
 Increased pay to 30 instructors @ \$500 each..... 15,000
 Probable increase for quarters..... 40,000

Total..... \$432,000

Grand Total, \$14,561,000 per annum ; an average of \$30.30 per man.

Each of her soldiers annually costs Germany about \$210.00, Austria \$190.00, France \$242.00, England \$371.00, and the United States about \$1000.00, while the State of New York expends for each member of her little army about \$35.00 per year. A plan which would give us trained soldiers for \$30.30 each, or for twice that amount, is worth considering.

What will neglect cost? Nothing, if we could shield ourselves from danger by shutting our eyes to it, or by receiving every warning with obstinate denial. Nothing, if we could strike terror to our enemies by the jingling of our gold or braggadocio speeches. But the one allures, and the other does not deter. Nothing, if we could count forever on the continuance of honorable peace. Much, if we accept the records of History, and the experience of every age and of every nation. Man has been fighting since the days of Cain. Before ever he wrought metal he chipped a dagger out of flint to slay his fellow. War will come, and if it finds us in our present posture, we must pay millions of money to purchase a short and shameful peace.

The expenditure here proposed would be five per cent. on the sum appropriated by the last Congress for pensions. It would be less than two per cent. on the bounties of the War; perhaps two per cent. on the ransom which might be forced from New York alone, under penalty of destruction; less than three-tenths of one per cent. on the booty which a victorious enemy might wring from the Nation; less than three-hundredths of one per cent. on the present value of the property it would protect, and less than one per cent. of the additional cost of a war which, finding us unprepared, should nevertheless leave us victorious. There is economy in preparation.

We might hope that universal peace might come of universal arbitration, if the arbitrators could have jurisdiction and power to enforce their decrees. If we could find a court where nations might sue; where neither mistake nor corruption could enter; where more than earthly wisdom could render exact and infallible justice; where more than earthly power could secure peaceable jurisdiction over Sovereign States who acknowledge no superior on earth, then war might cease forever, and "perfect law commensure perfect freedom." Until then the trial must be by ordeal of battle, and "We the people of the United States" will be the final judges, under God, of our rights among nations,—of whether we are wronged and how we shall be righted.

Such is the outline, necessarily bare and incomplete, of the means which would give us an army terrible to our foes, but never to our freedom, unswayed alike by demagogue and tyrant, patriotic as the people from whom it springs and of whom it forms a part. The question is not one of military, nor even of national vain-glory, but one which touches every interest that can animate

the human breast ;—all ages, both sexes, all classes and all conditions. Preparation, not for aggression but for defense, is counselled by the past and demanded by the future. Our country's destiny is not yet accomplished. The splendor of her past is but the twilight of her future. As in the years gone by, the oppressed of the world found refuge on her shores, from those shores, in years to come, the spirit of freedom must spread, while she stands the protector, not the oppressor of free America. With such an army, in and of the people, respect abroad, the meed of strength well ruled and justly exercised, shall protect her citizens in every land and on every sea, while tranquility at home shall prove the eternal truth of the saying of old "*The Citizen Soldier is the True Safeguard of the Liberties of the Republic.*"

THE DEVELOPMENT OF RAPID FIRE GUNS AND THEIR RÔLE IN MODERN WARFARE.*

BY LIEUT. GEO. W. VAN DEUSEN, 1ST U. S. ARTILLERY.

AS the name would indicate, a rapid fire gun, or, as it is generally termed in Europe a quick-firing gun, is one constructed with the especial object of attaining great rapidity of fire, this rapidity being combined with other attributes of a high-power gun, namely, penetration and accuracy. For this purpose several conditions are necessary. The gun must be breech-loading with a comparatively simple breech mechanism, not liable to get out of order or to allow the firing to be delayed by any jamming of the charge; some means must be devised by which the loading can be done very quickly; and the gun must be so mounted as to reduce the recoil to little or nothing, and thus prevent the delay caused by the necessity for running up and re-laying the gun after each round.

The question of quick loading was solved by the use of metallic cased ammunition, that is, ammunition in which the charge is contained in a metallic case,—the projectile being generally contained in the same case,—and which is fired by means of a primer of some description placed in the head of the case. The use of this metallic cased ammunition also assists in the simplification of the breech mechanism, since the case acts as an obturator to prevent the escape of gas, and thus dispenses with the use of a more or less complicated gas check.

A rapid fire gun may therefore be generally defined as one using metallic cased ammunition, the projectile being either one with or separated from the charge, the empty cartridge being wholly or in part extracted by the breech mechanism, the operation of loading being performed entirely or in part by hand, and, when recoil is permitted, the gun being returned to the firing position automatically, or promptly checked by suitable brakes.

Although the smaller calibre machine guns come most decidedly under this head so far as rapidity of fire is concerned, they

*Artillery School Essay selected for publication in the JOURNAL M. S. I.

do not fulfil other conditions and are therefore classed separately as "machine guns," their rôle being, in many respects, different from that of the rapid fire gun proper. It is an essential feature of this latter class that they be capable of firing shells with bursting charges, shrapnel and case, which in itself would serve to distinguish them from what are commonly known as machine guns.

The inception and development of rapid fire guns may be ascribed to the Naval Service, arising from the increasing importance of torpedo boats as agents in naval warfare. As these boats increased in power and speed, it was found, naturally, that the ordinary high power guns were not sufficient to protect a ship against their attack, on account of the small target afforded by them, their great speed and the comparative slowness with which aimed shots could be fired from the high power guns under even the most favorable circumstances, this difficulty being aggravated in the case of an attack by night. The small calibre machine guns were practically useless against such enemies. The naval authorities of France were the first to take practical steps in the matter and in 1877 they adopted the 37 mm. revolving cannon of Hotchkiss, which was also gradually adopted by other nations. Although this is also a machine gun, and is generally called so, yet it fulfils some of the conditions of a rapid fire gun, and may justly be considered as the first step in the development of this type of gun.

In the meantime torpedo boats had been increasing in speed and size, and were much better protected, so that it was soon found that the revolving cannon with a muzzle velocity of less than 1500, f. s. was no longer sufficient to meet the new conditions. In 1880 a single fire gun throwing a $2\frac{1}{2}$ lb. shell, made by Hotchkiss, was successfully tested in Paris, though after the trials, the form of the breech was changed from a square box screwed on to the body of the gun to the present jacketed shape. This gun may be fairly considered as the first specimen of the modern rapid fire gun, for although Nordenfelt was at the time engaged in the construction of a 6-pdr. in England, the gun was not actually completed and tested until after the Hotchkiss trials in France. These two, the Hotchkiss and Nordenfelt, were the first systems of rapid fire guns, and for some time—until about the end of 1885—were practically the only ones.

In the latter part of 1881, the English Government invited

the different ordnance manufacturing firms of that country to compete, under certain conditions, in a trial of 6-pdr. rapid fire guns, and later the privilege of entering the competition was extended to the Hotchkiss Company. The French Government also invited competitive trials for 3-pdrs., to which invitation only the Hotchkiss firm responded. In England three guns were entered, the Hotchkiss, Nordenfelt and Armstrong. The last named was entirely different from the Armstrong of to-day, and was withdrawn early in the trial. The Hotchkiss seemed to fulfil better some of the conditions of the trial, especially that of no recoil, and in an order given resulting from this competition, two-thirds were Hotchkiss and one third Nordenfelt.

It may be stated here that, from the beginning, one difference in what may be called the rival systems of Hotchkiss and Nordenfelt has been that in the Hotchkiss system the gun has been made heavier in order that by its weight it might take up much of the force of discharge and thereby diminish the tendency to recoil, while Nordenfelt has consistently advocated a short recoil and automatic return to the firing position, thereby using a lighter gun. Hotchkiss claims that by making his gun heavier he is enabled to use a mounting enough lighter to make the total weight of gun and mounting less than for a lighter gun using a heavier mounting.

The first order ever given for rapid fire guns for actual service was the one by the United States Navy Department in 1884, when a number of Hotchkiss guns were ordered to form parts of the armaments of the *Atlanta*, *Boston*, *Chicago* and *Dolphin*. Although no experiments with the guns had been made at that time in this country, our government evidently considered the results of experiments abroad sufficiently decisive to justify an order for the guns without going to the trouble and expense of trials at home.

Up to near the close of the year 1885, the Hotchkiss and Nordenfelt were the only competing guns of this type and had the field to themselves. The Hotchkiss was at this time manufactured in England by the Armstrongs. After 1885 other systems began to appear in the field and at the present date there are quite a number in existence. The principal among these are the Hotchkiss, Nordenfelt, Armstrong, Krupp, Driggs-Schroeder, Gruson, Maxim, Throuson, Engström, Canet, Dandeteau-Darmanier and Skoda. These guns are designated by the names of their inventors, and differ principally in the construction of the

breech mechanism. At first most rapid fire guns were designated by the weight of the projectile in pounds, but now many, especially of the larger calibres, are distinguished by the diameter of the bore in inches, or corresponding French units.

Originally, in all systems excepting the Nordenfelt, a non-recoil mount was in general use. Practical experience has shown that this produced too great a strain on the mountings, and it is probable that in the future all guns will be placed on mountings allowing a small amount of recoil. This will be accompanied by an automatic return into battery for all fixed mountings, the return being effected by the reaction of powerful springs, which are compressed by the recoil and react so quickly that the recoil and return are practically instantaneous. In this way the strain on the mounting is greatly decreased and the ballistic properties of the gun much improved. Of course, this will not be possible for field carriages, in which recoil will have to be checked as quickly as possible by means of properly constructed brakes.

The shortest and best way of showing the stage to which the development of rapid fire guns has arrived will probably be by giving a brief description of the different systems, showing their principal features, calibres, etc.

First in chronological order and also in number of guns in actual use comes the Hotchkiss. The origin of this system has already been described. First produced at the call of the French marine officials, it was adopted as a part of the naval armament of that country, and a large part of its history has been worked out in France. It is now manufactured in six calibres, designated both in linear measure and weight of projectile, viz.: 1.46-inch or 1-pdr., 1.85-inch or 2½-pdr., 1.85-inch or 3-pdr., 2.24-inch or 6-pdr., 2.56-inch or 9-pdr., 3.94-inch or 33-pdr. Designs have also been completed for the 4.724-inch or 36-pdr.,* 4.724-inch or 55-pdr.,* and 6-inch or 99-pdr., but no guns have yet been made. Of these guns the 3-pdr., which is considered the ideal anti-torpedo-boat gun, has been in the greatest demand, 1983 having been ordered up to March 31, 1890, against 620 of the 6-pdr., the next highest. The Hotchkiss guns are made of steel which is subjected to higher tests than that used in ordinary gun manufacture, on account of the sudden and long-continued stresses to which

* The light 4.724-in. gun is 37 calibres in length and weighs 4730 lbs., while the heavy 4.724-in. gun is 43 calibres in length and weighs 7300 lbs.—*Engineering*, Mar. 27, 1891.

the gun is subjected. The forgings for the gun being small, it is comparatively easy to obtain steel of the required quality. All, excepting the two lightest calibres, are strengthened by a jacket. The 33-pdr. alone has a special ring for the trunnions.

The breech mechanism of the Hotchkiss system is probably the simplest and least liable to get out of order of any of the rapid fire guns. The breech-block is rectangular in horizontal cross-section and contains the firing apparatus. To open the breech, the handle is pulled backwards and the breech-block descends, cocking the trigger in the act. When it is nearly down, by giving a jerk to the handle, the cartridge case is ejected and the gun ready for loading. The cartridge is pushed in by hand until not more than a quarter of an inch projects from the bore, and the breech closed by the reverse motion of the handle.

It is considered by some that certainty of action is sacrificed to simplicity in this system. As the extractor only engages on one side of the rim of the shell, should that give way or be damaged at that particular point, there would be some difficulty in making the extraction, which danger would be obviated by having the extractor grasp the shell on both sides, as is done in most other systems. There is also the danger that in the excitement of rapid firing the cartridge might not be pushed far enough into the bore, in which case there would be more or less jamming. It is also claimed that since considerable force is required to eject the empty cartridge case, the laying of the piece is more likely to be disturbed. However pertinent these objections may be, the fact remains that the system has successfully undergone many practical tests and still remains one of the favorite types of rapid fire guns. The 3-pdr. and 6-pdr. are mounted on field carriages for land service as well as on naval mountings. For a long time Hotchkiss was a persistent advocate of no recoil, but his latest mountings have been modified so as to allow limited recoil, though probably much less than in any other system.

Next to the Hotchkiss, both in order of time and practical experience, comes its rival, the Nordenfelt. This system was being developed at the same time as the Hotchkiss and their first trials were separated by only a short period. Since then there has been a sharp rivalry between them, and they have often been brought into direct competition, in most of which trials, each has claimed the victory. The Nordenfelt has been developed in England, and may be considered as the English representative type

of the rapid fire gun, although the Armstrong also originated in that country.

The Nordenfelt breech mechanism, like the majority of the rapid firing guns, is on the falling wedge principle. It consists of a block having a vertical motion from front to rear, and a wedge with a vertical motion working in guides in this block. The first motion in opening the breech gives a downward motion to the wedge, until it is arrested by a stud working in a slot. The rest of the movement consists of the block and wedge together describing a downward circular path to the rear, which completely opens the breech and extracts the empty cartridge case. The breech mechanism is operated by a lever, being opened by pulling the lever to the rear and closed by the reverse motion. It is not necessary to press the cartridge home as carefully as in the Hotchkiss, as the circular motion of the breech-block presses the cartridge into place without danger of jamming. The extractor would seem to be more certain in its action, as it grips the shell on both sides at once. The gun cannot be fired until all the parts are in the firing position, which condition is provided for in some manner in the breech mechanism of every type of rapid fire gun now in existence. The entire Nordenfelt breech mechanism can be dismounted and taken apart in a very short time without any special tools, by means of one key contained in the mechanism itself.

Of late years Nordenfelt has devoted much attention to the development of rapid fire guns for land service, and especially for use in the field. He has constructed three types for trial by the English Government, an 8-pdr. field gun, a 6-pdr. for horse artillery and a light 3-pdr. mounted on a galloping carriage. All the carriages are provided with an improved nave brake for reducing recoil to a minimum. The caisson and limber for the 8-pdr. gun, together hold 180 rounds of fixed ammunition, and each gun carries 6 rounds of case on the trail for use in sudden attacks. Mr. Nordenfelt considers the 8-pdr. as about the maximum size to which the principles of rapid fire can be adapted for field service.

The Armstrong rapid fire gun was also originated at about the same time as the Hotchkiss and Nordenfelt, and one of the guns was entered in the first competitive trial in England. It was not successful, however, and was withdrawn early in the contest, and shortly after the Armstrong Co. took up the manufacture of Hotchkiss guns in England. The Armstrong gun of the present

day is entirely different in principle and design from the first of that name, and has been more especially applied to the heavier calibres of rapid fire guns. The breech mechanism in this system is quite different from that of most rapid fire guns. It consists of the ordinary screw-plug with double interrupted thread, the plug being coned to facilitate opening and closing the breech. There is no hammer or firing-pin, the charge being ignited by electricity. The principal Armstrong guns now made are the 4.7-inch or 30-pdr., the 36-pdr., 70-pdr. and 6-inch or 100-pdr., which are coming largely into use for secondary batteries on ships of war. In the 100-pdr. one of the original principles of a quick firing gun has been abandoned, and fixed ammunition is no longer used on account of the weight. The powder is in the metallic case, but the projectile and charge are loaded separately. The projectile weighs 100 pounds and the ordinary charge is 34 pounds. The first experiments with these guns were not entirely satisfactory, but some recent trials at Portsmouth have been very successful. Ten unaimed shots were fired from a ship in 1 minute 31 seconds, and ten aimed shots, alternating at two targets, in 2 minutes and 4 seconds. The firing was entirely done by electricity and there was not a miss-fire in the entire practice. The gun crew consisted of five men, but it was claimed that one man could have kept up a fairly rapid fire for a short time.

The Krupp system is very similar to the Hotchkiss, having a wedge with a vertical movement and needs no separate description. Krupp does not seem to have devoted as much attention to the subject of rapid fire guns as some makers.

Of special interest to the Army at present is the Driggs-Schroeder system, since a number of these guns have been ordered by the War Department, which has also obtained the right to use the breech mechanism in the construction of field guns. One 6-pdr. has already been delivered and sent to the Watervliet Arsenal as a model for a 3.2-inch field gun with this mechanism.

In this gun the breech is closed by a single block, on the upper convex surface of which are projecting bands which fit in corresponding grooves in the upper interior wall of the gun, thus taking the recoil effort. In opening the breech, the first motion of the block is downward, and then a rotary motion to the rear, leaving the prolongation of the bore open. There are two extractors, one on each side, and the gun is fired by a trigger under a pistol

grip on the right side of the gun. In this system the breech has no opening through the top, so that dust, rain, etc., can only enter from below. The movable block is very light, and as it revolves about an axis within itself, the weight to be handled is still further reduced. It is not necessary to press the cartridge entirely home, as this is done by the rotary motion of the block. This mechanism has worked extremely well as far as tried, and on account of its lightness, would seem to be particularly applicable to large calibres of rapid fire guns. The 6-pdr. delivered has a length of bore of 46 calibres and is expected to give high ballistic results.

Two types of rapid fire guns have recently originated in France, the Dandeteau-Darmancier and the Canet. The first is manufactured at St. Chamond, and is to be applied to calibres as high as 6.1-inch. The breech plug is the interrupted screw of three equal sectors, and is entered and withdrawn by a single rectilinear motion of a handle. This system has not yet received many practical trials, but more labor is said to be required for opening the breech than with most rapid fire guns, which would be an objection.

M. Canet has done so much in recent years to revolutionize the French artillery that anything springing from his brain may well be deemed worthy of careful consideration. He has lately turned his attention to the subject of rapid fire guns, and has apparently succeeded with them as well as with the other branches of artillery work which he has taken up. The best result ever known to have been obtained from any gun was with his 5.91-inch rapid fire gun in May, 1890, when, with a smokeless powder and safe chamber pressures, an initial velocity of 2887 f. s. was obtained, the energy developed being 1027 f. t. per ton of gun. This velocity would be equivalent to a penetration of 15.6 inches of steel at the muzzle.

The Canet guns consist of a steel tube extending the length of the gun, which is reinforced by a jacket on which is placed the trunnion ring, this being screwed on. In front of the jacket is shrunk a long conical hoop. Each calibre gun is to be constructed in three lengths of 30, 40 and 50 calibres respectively. The breech block is on the interrupted screw system of four equal sectors, and is supported by a bronze ring of considerable depth. This ring is locked to the body of the gun when the breech is closed, and to the block when it is open. The breech is opened

by pulling a handle from right to left. A pinion working in beveled teeth moves the block through one-eighth of a turn, when it is free to be withdrawn through the face plate. When clear of the face of the breech, the plug and face-plate swing together on a hinged bolt clear of the breech, leaving the gun ready for loading.

In all sizes yet made fixed ammunition is used, and is said to be very easily handled, though the complete cartridge for the 5.91-inch weighs about 150 pounds. Of course this is too heavy to be handled by one man, but mechanical appliances have been introduced to assist in the loading. The Canet guns are now made in the following calibres, 2.64-inch, 2.95-inch, 3.54-inch, 3.94-inch, 4.72-inch, 5.51-inch and 5.91-inch. They can be fired in the ordinary manner or by electricity, the latter method being preferred by the inventor, especially for the larger calibres. These are also provided with electrical training gear. Many of the new Canet guns are fitted with an automatic sighting apparatus, by which the rapidity of fire is much increased, as when the rear sight is set at the required elevation, the gun is at once raised to the same angle.

Extensive experiments with rapid-fire guns have been made in Germany by Gruson, especially with field guns and shielded mountings for the same. The Gruson breech mechanism is on the wedge system with a vertical motion, and is very simple and certain in operation. It contains only 19 pieces and works with ease at a rate of from 35 to 40 rounds per minute. A very interesting set of trials, devoted to rapid fire guns and mountings, was held in September, 1890, at Gruson's proving grounds at Tangerhütte and Buckau. A very brief notice of some of the trials pertaining to field artillery may not be out of place here as giving some idea as to what may be done with rapid fire guns in field service.

One of the first experiments was for accuracy, and to test the rapidity with which the breech mechanism could be operated. A 2.22-inch gun discharged twenty-five projectiles in half a minute through the same hole in a target placed at a distance of 50 yards. Of course the gun was on a fixed mounting, and there was no recoil or other disturbing influences.

The 1.46-inch mountain gun on its carriage was fired for one minute and twenty seconds at a target 1094 yards distant. Ten aimed shots were fired, and of these, seven were within a rectan-

gle $3\frac{1}{2}$ feet by $2\frac{1}{2}$ feet. The remaining three were from 2 to $2\frac{1}{2}$ feet wide of this group.

The 1.85-inch light field gun was fired at a line of skirmishers at a distance of 1312 yards. With ten rounds of common shell fired deliberately, only two skirmishers in the front row escaped, the other twenty receiving 69 hits, while there were 10 hits on the supports in rear. This gun is provided with a shielded mounting which can be brought on the field by one strong horse.

The 2.09-inch field gun was fired 20 rounds of shell and shrapnel at skirmishers distant 1640 yards. In this case the nave brake was applied and the gun was not run forward between the discharges. The total recoil was 22.15 feet. There were 55 hits on the skirmishers and 10 on the supports. This gun is especially designed by Gruson for use in the field, and is provided with a light carriage for that purpose.

The 2.24-inch field gun was fired 11 rounds without running up, and the total recoil was found to be 21.3 feet. This gun is provided with two shielded mountings, one movable and the other disappearing. The movable mounting is drawn by three horses abreast, the total weight being 2.85 tons. It can be brought into action with the horses still attached, the recoil being taken up by short thick legs in rear. The horses were unhitched and the mounting placed in a shallow pit by one non-commissioned officer and eight men in $20\frac{1}{4}$ minutes. By using more time it can be sheltered so that only the dome shaped top will be visible. This arrangement might be very useful in a besieged place, to take up an advanced position in order to annoy some particular point of the besieger's works. The disappearing mounting is stationary. In this the recoil of the gun is absolutely checked when the gunner's seat is turned down, and the mounting cannot descend until this seat is turned up and the gun withdrawn into the interior of the mounting.

Experiments were also made with a 4.72-inch howitzer, firing at a field work at a distance of 3281 yards. The results were not good, as only three hits were made.

In these trials smokeless powder was used with excellent results. Herr Gruson appears to have proceeded further with the development of rapid fire guns for field service than any other manufacturer, and we may look forward with interest to further reports from his establishment.

The Engström gun is the invention of Lieutenant Engström of

the Swedish Navy, and has been adopted for use in the navies of Sweden and Norway. The breech mechanism is a peculiar one, the opening and closing being effected by the action of a handle on two sectors. The upper one, which is attached to the handle, has two tenons, and the lower one, attached to the breech block, two mortises. The breech being open, the handle is pulled backward and the first tenon in the upper sector engages in the corresponding mortise in the lower one. The breech block is revolved upward, and by the time the first tenon is ready to leave its mortise, the second tenon engages in the other mortise and keeps the breech block in motion until it is in place, when it is completely closed by a spring plate. This breech mechanism is very light and is said to work easily and quickly. Only one calibre has yet been constructed, the 2.24-inch.

The Skoda, an Austrian invention, and the Thronsen, constructed in Sweden, both have breech closures on the falling wedge system and present little novelty in their construction. In the Thronsen the operating lever comes out from the rear of the breech instead of from the side as in most types of this nature.

The Maxim semi-automatic shell gun is a new departure in the direction of rapid fire guns. It is the invention of an American, the inventor of the automatic machine gun bearing his name. In this gun the only operation necessarily performed by hand is the insertion of the cartridge into the bore, all the rest being performed automatically if desired. The firing may be done by hand, and would probably be so performed under ordinary circumstances. This gun is composed of tube and jacket, but the latter does not give any additional strength to the tube, acting simply as a cradle to support the tube, which moves through it in recoil. The tube has a recoil of about six inches, a portion of the recoil energy being utilized in performing the operations of cocking the lock, opening the breech, ejecting the empty cartridge case and closing the breech. When the gun is fired, the barrel and breech mechanism recoil together. At the end of recoil the barrel is brought back to the firing position by the spring in the recoil cylinder, while the breech is left open, the empty cartridge case being extracted and the piece being then ready for loading. When the cartridge is inserted, it strikes against the claws of the extractor, releasing a powerful spring, at the time in a state of compression. This spring when released closes the

breech block, pushing the cartridge securely into place and the piece is ready for firing. The trigger can be secured so that the gun will be fired automatically as soon as loaded, in which case the only hand operation is the insertion of the cartridge.

This gun would seem to be an improvement over ordinary rapid fire guns in cases where great rapidity of fire is desired, and there would be no time for re-laying the piece between rounds. The work of opening and closing the breech being automatically effected by the action of recoil, there is much less chance for the laying of the piece to be disturbed than when these operations are performed by a lever operated by a man in a greater or less state of excitement. The gun can also be much more easily served by one man, if necessary, than any of the other types. Of course the mechanism is more complicated, but the parts seem to be well arranged to stand service conditions, and although the gun has not been very thoroughly tested, the machine gun, which is much more complicated, has undergone severe trials extremely well. Three, six and twelve pounders have been or are being made, and designs have been prepared for guns as high as forty pounders.

At the Washington Navy-yard are being constructed two types of rapid fire guns, the breech mechanisms being the inventions of Ensign Dashiell of the Navy, and Mr. Lynch, one of the employés at the Navy-yard. The Dashiell mechanism resembles in many respects, the Canet, but there are several modifications. It is on the interrupted screw system, and opens with a handle like the Canet, except by the reverse motion, being from left to right, while the Canet is from right to left. It is expected to apply this mechanism to guns up to 6-inch calibre.

The Lynch gun is in process of construction and no breech mechanism was to be seen. The breech of the gun would indicate that it works on a similar principle to the Driggs-Schroeder. It is to be used for guns up to 6-pounders.

Glancing over the development of rapid fire guns, it will readily be seen that they have long since outgrown the object for which they were originally designed. From the 2½-pounder introduced by Hotchkiss only eleven years ago for the purpose of defending vessels from the attacks of torpedo boats, they have rapidly increased in size and power, until now they are available for many other purposes than the original one. It would seem that the limit has about been reached to which the principles

considered essential to a rapid fire gun can be applied, and even now, in the Armstrong 6-inch, the use of fixed ammunition has been abandoned, though the metallic case is still kept to contain the charge and act as an obturator. However, it is said that M. Canet intends to push on still farther, and does not consider that he has reached the limit with his 5.91-inch gun. As to breech mechanism, there appears to be a growing opinion in many directions that, for the large calibres, the wedge system will have to be dropped and some form of the interrupted screw used. It is claimed that although the wedge is excellent for small guns, it becomes too cumbersome in the large sizes. How true this may be is for the future to decide, but it is a significant fact that the makers who have had the greatest experience with large calibres, Canet and Armstrong, are both in favor of the interrupted screw.

It is probable that the next step in the development of rapid fire guns will be a decrease in the size of the powder chamber and strengthening of the walls of the chase, due to the use of smokeless powder, which, with smaller charges than ordinary powder, gives the same chamber pressures and higher pressures along the bore.

The rôle which rapid fire guns will be called upon to play in the warfare of the future, bids fair to be a very important one, far beyond anything which could have been anticipated when the system was first introduced. As the guns were first invented for naval purposes, and the greater part of their development up to the present time has been in that direction, it is natural that at the present, their rôle on sea should appear in greater prominence than on land. It would seem as if the extent of their future usefulness will greatly depend on whether or not the experiments now being made with smokeless powders are completely successful. There can be no question that powders of that description have been discovered which give most excellent results, but the great question to be determined is regarding the keeping quality of the substance. With ordinary powder the usefulness of rapid fire guns will be greatly limited by the immense quantities of smoke evolved by the rapid discharges, and which will soon conceal the target from view. But with smokeless powder, this trouble will no longer exist and the rapidity of fire will come into full play. The question of the keeping qualities of the powder will necessarily be of greater importance for the navy than for

land service, since a ship starting off on a cruise of, possibly, two or three years' duration, must carry her supply of ammunition with her from the beginning, so that a powder which would not keep uninjured for at least that length of time would necessarily be a very uncertain factor.

In considering the rôle of rapid fire guns in the future, their use in naval warfare will naturally be the first to be brought up, though very briefly. The first, and up to the present day, the most important use has been to ward off the attacks of torpedo boats, and also to serve as the armaments of the torpedo boats themselves. This applies to the calibres up to 6-pdrs., which are intended especially for this purpose, though, of course, the larger ones could and would be used if needed. To show the necessity of something more than the ordinary high power B. L. guns to resist such an attack, it may be well to quote briefly an illustration given in an essay by Lieut. Southerland, U. S. Navy. If the *Baltimore* should be attacked by a torpedo-boat of the type of the *Cushing*, the latter would be under fire from about 1500 yards up to 400 yards, the point where she would discharge her torpedo, a total distance of 1100 yards, which distance it would take the torpedo-boat about one minute and twenty-nine seconds to traverse. While running this distance, she would be exposed to the fire from two 8-inch B. L. rifles, three 6-inch B. L. rifles, two 6-pdr. Hotchkiss guns and one 3-pdr. Hotchkiss gun. During this time the five B. L. rifles would, under the most favorable circumstances, get in 13 shots, and the chances of a hit from any of these shots would be small owing to the difficulty of operating the training gear quickly enough to get accurate aim on such a small and swiftly moving target. During this same time, the three rapid fire guns would easily get in twenty aimed shots each, or sixty for the three. The chances for hitting would be much more than proportionate to the increased number of shots, on account of the greater ease and accuracy with which the rapid fire guns can be aimed. One of these projectiles penetrating the machinery would do great damage, even if it did not positively disable the boat. The later types of torpedo boats have themselves been armed with one or more rapid fire guns, generally 3-pdrs., principally to defend themselves against other torpedo boats and from attacks by small boats. There would also be a chance that in a night attack a lucky shot from one of these guns on the torpedo boat might disable the search-light on board the

vessel to be attacked, and thus afford an opportunity for discharging a torpedo in the darkness.

As the value of rapid fire guns became more fully appreciated, they were increased in size, until now they form the secondary batteries of all modern men-of-war. The larger calibres, from 4 to 6-inch, may well be classed among other high-power armor piercing guns, and will probably, in the near future, displace all B. L. guns of 6-inch calibre and smaller, being much simpler and easier of manipulation, and capable of much greater rapidity of fire, while their power is shown by the results obtained with the 5.91-inch Canet gun. These secondary batteries are very effective for the attack of the unarmored portions of vessels, exposed guns, and, in fact, all portions not protected by the heaviest armor. For the cases in which great mine power is required, the large B. L. rifles must be used. The rapid fire guns of the secondary battery are also used as range finders for the large guns. Finding the range by trial shots from the heavy B. L. rifles would be very expensive amusement, considering the money value of each round, and the operation can be very cheaply and readily performed by these small guns and the sights of the others regulated accordingly.

One of the most striking examples of the present use of rapid fire guns is found in the Italian unarmored cruiser *Piemonte*. This vessel has a length of 300 feet, a displacement of 2500 tons, and a speed of 21 knots. She is intended as a commerce destroyer, and with the coal supply carried, can steam 13,500 miles at a rate of 10 knots. She has an armored deck and is armed entirely with rapid fire guns. Her armament consists of six 6-inch Armstrong guns, six 4.7-inch Armstrong guns, ten 6-pdr. Hotchkiss guns, six 1-pdr. Hotchkiss guns, four 10-mm. Maxim machine guns, and three torpedo tubes. It is contended by many that the weight of metal which she can concentrate on any point in a given time through the rapidity of fire, will, together with her speed, more than compensate for her lack of heavy guns. From her construction she is not intended to fight at close quarters with armored vessels.

The *25 de Mayo* recently constructed for the Argentine Confederation is modelled after the *Piemonte*, but has two 8-inch B. L. rifles in addition to the rapid fire guns.

England is making use of rapid fire guns to provide for a number of swift cruisers for service in case of war. The *White Star*

steamships *Teutonic* and *Majestic* are each prepared for an armament of twelve 4.7-inch Armstrong rapid fire guns. These guns are to be mounted only in case the vessel is employed as an armed mercantile cruiser on active service. The *Empress of India*, running from Vancouver, B. C., to China and Japan, is prepared in the same manner, guns being stored at each end of the route so as to be available in the shortest possible time. With these and others, either constructed or in process of construction, under similar conditions, England will be provided in case of war with a fleet of very formidable cruisers. Their speed will enable them to avoid vessels capable of crushing them, and they can do almost incalculable damage to commerce, while able to compete with the lighter unarmored cruisers.

The rôle which rapid fire guns will be called upon to fill on land may be considered under three heads, viz.: Sea-coast Defense, Siege Operations on Land Fronts, and Operations in the Field.

When used on the sea-coast, they will generally be associated with heavy guns placed in permanent works. Nordenfelt has an embrasure mounting for some of his smaller shell guns, by which they can be mounted in the embrasure under the large guns, without the latter being removed. When not in use the whole mounting can be slipped to one side, and the embrasure left free for the large gun. This form is particularly applicable to many of the coast defenses of England, which are largely made up of massive structures of masonry and iron with very large embrasures.

Among the uses for rapid fire guns in coast defense may be mentioned the protection of systems of torpedoes and prevention of countermining, the defeat of attempts to land by storming parties and also the attack of unprotected parts of ships when they come near enough to be in range. To accomplish these purposes, it is generally considered that the rapid fire guns should not be mixed up with the heavy guns, since each might interfere with the working of the other. By placing the rapid fire guns in detached batteries on the flanks, possibly separated by hundreds of yards, this difficulty is obviated, and the secondary batteries are freed from the danger to which they would otherwise be exposed, that of being struck by stray shots from the enemy, directed at the large guns. If the ground permits, these guns might be advantageously arranged in two tiers, the lower one to engage the

vessels of the enemy with direct fire, while the upper tier would have a plunging fire on the decks and upper works. The upper tier would, probably, be practically unassailable by direct fire, and the guns would not require to be so carefully protected. In the lower tier the target would be very small any way, and with muzzle pivoting guns, the danger could be reduced to a minimum. The disappearing shielded mountings for these guns might be very useful in some places.

Modern torpedo systems will be protected by fortifications provided with search lights covering the entire field, and will have electrical communication with the shore, indicating when any part of the system is disturbed. With these accessories, and strong batteries of rapid fire guns ready to be directed on the endangered spot at the first alarm, the process of removing torpedoes, always a slow and dangerous one, would be rendered practically impossible, either by day or night, as would also the landing of storming parties in the vicinity of the defenses. These guns will also be very useful as range finders for the large guns. The upper tier of rapid fire guns should be so arranged as to sweep all the ground in front of and in the vicinity of the main battery, so that even if a storming party should succeed in landing, it would be almost impossible for them to meet with any success in the assault, in the face of the hail of shrapnel and case which could be directed against them. These rapid fire guns will also play a rôle on land analogous to their original use on ship-board, namely, to defeat the attack of torpedo boats. At the approach of a hostile fleet, shipping, both vessels of war and merchantmen, will take refuge in the harbor under the protection of the guns of the forts. The enemy will endeavor to destroy this shipping, not only by fire from the fleet, but also by sending in torpedo boats to discharge their weapons among the vessels. The defense against these will fall on the rapid fire guns. Taking all things into consideration, it would seem as if the rôle to be played by these guns in the armament of our hoped for coast defenses of the future, though necessarily minor to the long range guns, will be far from an unimportant one. It is the opinion of some naval officers that in the bombardment of Alexandria a very important part was played by the gunboats armed with light B. L. rifles and rapid fire and machine guns. These vessels being light and easily manœuvred, ran in close to the works, drove the gunners from their pieces and thus left them exposed to the attack of the

heavy iron-clads stationed at some distance from shore. From the facts in this case they argue that the same will hold in future bombardments. But the fact must not be forgotten that the armament of the Egyptian works was of inferior quality—consisting of old smooth-bores and a few Armstrong M. L. rifles—the guns were poorly served, and the works themselves had very slight command, and afforded little protection to the armament. It can hardly be doubted that the tables would be turned were these gunboats opposed by well disposed groups of rapid fire guns, firing from stable platforms and manned by competent gunners. It does not seem to be assuming too much to say that no gunboat or similar vessel could venture close enough to shore under such circumstances to enable her to make use of her machine guns or even her rapid fire guns to any advantage.

To obtain the best results these groups of guns, especially those in the upper tier, should be considerably scattered and so arranged, within the limits permitted by the nature of the ground, that the rapidity of fire of any group will not be disturbed by smoke from the others, and also so that they will not interfere with the fire of the main batteries. As mentioned before, in some exposed positions, it might be advisable to place them in strong disappearing shielded mountings, since these would afford so small a target as to be practically safe from the large guns on boardship, and would be strong enough to resist the projectiles of lighter guns at short ranges. As a matter of course no fixed rule can be laid down for the position of these guns, as it will vary with each point to be defended, but it cannot be doubted that they should form an essential component of the armament of every properly fortified point. But little attention has been paid in this country to these guns in this connection up to date, and it is not yet necessary. The principal and most important struggle is to get the large guns in process of construction, and prepare the places in which they are to be mounted. When they are needed, the rapid fire guns can be procured in a very short time and at a comparatively small expense, and it will not take very long to prepare their future resting places.

The rôle to be played by rapid fire guns in the attack and defense of land fronts of permanent works, is, in this country, of minor importance to sea-coast defense. The probabilities are that this country will never be called upon to construct the permanent fortifications which are so necessary in Europe, and in

case of war the strongest fortifications will probably be carefully constructed field works, defended principally by field guns with a few siege guns. In Europe, however, the case is far otherwise, and much attention is being paid to the use of rapid fire guns during the different stages of the attack and defense.

The besiegers will not probably find as much use for rapid fire guns as the besieged, but still may find them of considerable advantage. Generally in the first and second artillery positions, field batteries are used on the flanks to annoy the besieged, prevent repairs to breaches and assist in repulsing sorties. These can be advantageously replaced by rapid fire guns, which can concentrate a more intense fire on any point, and by their smaller size and greater mobility, will afford a smaller target for the artillery of the besieged. Before an assault, the fire of rapid fire and machine guns could be used to drive the enemy away from the vicinity of the breach, and thus prepare the way for the storming party.

With the besieged, however, rapid fire guns may form a very important factor, and this importance has been increased of late by the improvements made in the means of protecting these guns. The constant endeavor of the besieged is to annoy and harass the enemy at all points of his approach, and especially when he is gaining the first foothold by the establishment of the siege batteries of the first artillery position. Against this should be directed all the available guns of the works, reinforced by such movable guns as can be brought into use, and what guns could be better for that purpose than the mobile rapid fire guns, whose range is sufficiently great to render them dangerous? But the defense should not be confined to the parapets of the main and intermediate works. Light guns should be thrown out far to the front to attack exposed points of the enemy's work. For this purpose the rapid fire field gun of Gruson with its movable shielded mounting would be particularly useful. Drawn to the chosen position by its three horses, it could quickly be placed in a pit so as to be almost completely sheltered from the fire of the enemy. When the period of its usefulness in that particular position was over, or it was threatened with capture, it could be quickly removed within the work, the withdrawal being covered by the fire of the guns on the parapets. The second artillery position is generally established in the vicinity of the first parallel, and as it is now composed principally of howitzers, it should not

be at a greater distance than from 2000 to 3000 yards from the work to be attacked in order to obtain an effective fire. This distance is easily within range of all rapid fire guns, and they would do most effective work in delaying the construction of this position and parallel. The disappearing mountings for these guns would seem to be especially useful at this stage. A number of these scattered along the parapets would pour in a most effective fire and would afford an extremely small target for the besiegers. The rapid fire guns placed in intermediate batteries would also form an important feature at this point. The howitzer batteries once established, being sunken, would be in a measure protected from direct fire, and for searching them out the light rapid fire howitzer in its disappearing mounting would seem to be just the weapon needed. The advance from the first parallel to the ditch by trench and sap would be made very costly to the besiegers by the rapid fire guns, which by their concentrated fire would soon render trench work impossible, and seriously interfere with any sap excepting of the deepest kind. This underground work will have to be continued to and even across the ditch, as an open assault in face of rapid fire and machine guns may be considered as almost a thing of the past.

In modern fortifications, ditch defense is obtained almost entirely by means of ditch *caponnières*, which, in the most recent, are armored and made as small as practicable so as to suffer as little as possible from the fire of the enemy, who will endeavor to render these defenses valueless before attempting to cross the ditch. By arming them with rapid fire and machine guns, which require very limited space for manœuvring, their size can be reduced to a minimum and the efficiency of their fire, at the same time, increased. To prevent an open passage of the ditch, machine guns would be sufficient, but a few rapid fire guns will be needed to destroy any works the enemy may attempt to erect in the ditch to protect his crossing, and also to destroy shields and scaling ladders should they be used. The ditch once crossed, the defense of the breach will depend almost entirely on rifle calibre machine guns.

It would seem that in siege operations the development of rapid fire guns has inured much more to the benefit of the besieged than the besiegers. But thus far it is entirely a matter of theory, and whether or not practical experience will support the theoretical deductions must be left to the decision of the future.

The special use of rapid fire guns for field service will be to pour in an extraordinarily rapid and intense fire at some critical moment, the relation to an ordinary field gun being as a magazine to a single breech-loading rifle. This additional power will be attained at an additional weight and expense due to the weight and cost of fixed ammunition, although this will not hold true if, as proposed, the ammunition for all field guns be put up in metallic cases. There must also be no recoil, or at least a very limited one, as the gun will lose its chief value if it is necessary to run it up and relay it after each round. Consequently the efficiency of the gun will depend greatly upon the brake used, hydraulic or pneumatic buffers not being available for use with such guns.

For several years there has been considerable discussion abroad as to the merits and demerits of rapid fire guns for field service, and it would seem that interest has been awakened in the country from the fact that we are to have 3.2-inch guns constructed with the Driggs-Schroeder rapid fire mechanism. In England the most persistent advocate of these guns for the field has been Mr. Nordenfelt, and he has manufactured several guns for trial by the British Government. In Germany Herr Gruson has also made great advances in this direction, some of his experiments having been previously mentioned. The idea in most countries at present is to use the rapid fire gun for horse artillery, and retain the B. L. field guns for ordinary field work. This is necessary for the reason that the size of the rapid fire gun must be limited by the fact that there must be very slight recoil, and in the heavier calibres the inclination to recoil would be so great that it could not be checked by any of the brakes yet discovered, and if checked, would be apt to produce too great a strain on the carriage. It is necessary, therefore, to reduce the weight of the shell to that limit which will allow the gun to be fired without a velocity of recoil great enough to overcome the friction against the ground of the trail and the wheels, held by an efficient nave brake. This result is not quite attained in practice, as there is a slight recoil and for very accurate firing it is necessary to relay the gun between rounds. But in a rush of skirmishers or cavalry where extreme rapid fire is needed, the recoil is not great enough to affect materially the value of the firing. This was illustrated in one of Gruson's experiments, where the gun was discharged eleven rounds in 51 seconds at cavalry targets without being run up. The total

recoil was $6\frac{1}{2}$ metres, and the gunner had been able to keep near enough to the trail during the firing to see that the gun remained pointed in the desired direction. The targets made were excellent. In a rush at close quarters where case is used, the general direction and elevation are all that are absolutely needed, rapidity of fire being much more necessary than accurate aiming. The rapid fire gun can be more easily kept in the same general direction as it has a traversing motion by hand wheels independent of the trail, so that the gunner can give a slight change of direction without going to the rear of the trail. The loss in weight and effect of each individual shell produced by diminishing the size of the gun will be more than made up for by the increased rapidity of fire, by which the weight of metal directed upon a given point in a given time will be greater than with the larger guns. The diminished weight of the gun and carriage can be utilized in providing gun shields for the protection of the cannoneers against infantry fire, the weight being still within the capabilities of the horses. There being practically no recoil, the cannoneers can keep well under the shelter of the shield, and this the more readily as they are less in number than with the ordinary field gun.

During the discussions regarding these guns, several objections have been made. The principal one is that it would be difficult to carry enough ammunition for the efficient service of the piece, both on account of the increased weight due to the metallic cartridge case and to the tendency to waste ammunition in the excitement of action on account of this ability to fire rapidly. The first portion of the objection will no longer hold if the metallic case is used for all field guns, and even if it is not, the number of rounds carried in the limber and ammunition wagon or caisson will be sufficient for ordinary needs. Nordenfelt expects to have 186 rounds for the 8-pdr., and 248 for the 6-pdr., always with the gun. The limber and caisson of our 3-inch rifle carries 240 rounds, this gun approximating to the 8-pdr. in weight of projectile. But against this loss in number of rounds carried must be placed the advantages of fixed ammunition. There is great advantage in having the powder in a hermetically sealed metallic case protected from moisture; the ammunition is much more easily packed and less liable to injury during transportation; the danger of accidental explosions with fixed ammunition is very small as compared with ordinary guns where the powder

is simply enclosed in a cartridge bag; and to these we may add that, as the ammunition can be placed in the limber in boxes, and a number of these removed and placed behind the shield ready for use when the piece is unlimbered, the labor and danger for the cannoneers will be greatly diminished from what it is when each round must be obtained from the limber. It is also estimated that, as the number of men required to serve a rapid fire gun is so much less than for a B. L. gun of the same calibre, in horse artillery there would be enough spare horses to provide at least one extra ammunition wagon for each two guns without increasing the total number of horses per battery. As to the waste of ammunition from unnecessarily rapid firing, that would depend greatly upon the character of the cannoneers. With properly trained officers and men, this danger should be no greater with rapid fire than with ordinary guns, and at close quarters where a maximum number of shots is required, the danger would probably be less with rapid fire guns, as the men would know that there would be no difficulty in firing even more than the required number and so could pay more attention to each shot and could even keep close enough to the piece to give it slight changes of direction by the hand wheels. With the slower firing gun, on the contrary, the men would feel that it would require their utmost endeavors to fire fast enough without paying attention to the result of the fire, and becoming excited and demoralized, would be apt to waste ammunition.

The objection has also been made that it would be impracticable, when time fuses were used, to set them properly as fast as they would be required. But as one trained man can set 15 fuses per minute, and as generally with a rapid fire gun the time would not be changed with each round even when firing at advancing troops, there would probably be no trouble on that score, as with the detachment for the Nordenfelt gun there are two men for that purpose.

For long range firing at artillery or other stationary objects, rapidity of fire would not be much of a desideratum, and the rapid fire gun would serve the same purpose as ordinary field artillery. The principal gain would be in the quickness with which the range could be found, and the saving in fatigue for the cannoneers by not being compelled to run up the piece for a considerable distance after each round, which, in long continued firing, becomes very burdensome. The gunners would be protected by

their shields from long range infantry fire, and when it was found that the enemy had gotten the range too accurately, the light guns could be quickly limbered up, moved a certain known distance to the rear or one side, and the firing resumed, the range being known to the gunners of the rapid fire guns, but unknown to the enemy who would be compelled to waste time and ammunition in finding it again. Movements of this nature can be executed much more easily with these light guns than with the heavier field guns. On account of their very limited recoil, these guns can often be placed in advantageous positions, as on narrow ledges, on the edges of swamps or marshy ground, or with the trail down-hill, where the ordinary field gun could not be used at all.

At very close quarters the great advantage of this type of gun is, of course, its great rapidity and intensity of fire. If, as has been stated, it is impossible to capture an ordinary field battery by front attack of infantry or cavalry, as long as the ammunition holds out and the gunners keep their wits about them, how much more certain will this be in the case of rapid fire guns, where the gunners are protected by their shields from the fire of the enemy, and are kept from being demoralized by the consciousness of the hail of metal which they can, at any moment, pour into the ranks of the advancing forces.

The rapid fire principle is of such comparatively recent invention and development, that there has been little chance for practical experience, especially on the land. Thus far, all of our knowledge has been from proving ground and manufacturers' tests, and it might very easily happen that these would produce quite different conclusions from those which would be the result of watching the behavior of the guns in actual warfare, where many of the conditions would naturally be considerably modified. As with most new inventions, there have been found people who took extreme views in both directions. The most enthusiastic advocates see in it the gun of the future, and claim that it will displace all B. L. ordnance excepting, possibly, the largest calibres, pointing to the *Piemonte* as a step in that direction. On the other hand, there have been conservatives who considered the true sphere of the rapid fire gun to be that for which it was originally introduced, as an anti-torpedo boat gun, and looked with distrust on any attempt to push it beyond what they considered as its proper use. But it may safely be said that at the present day the latter class counts very few among its numbers, if, in-

RAPID FIRE GUNS.

deed, it has not entirely disappeared. It would seem that the true sphere of the rapid fire gun in the future will lie somewhere in a mean between these two views. It is hardly probable that it will displace B. L. rifled guns above 6-inches in calibre for naval purposes or permanent fortifications, and Nordenfelt thinks the 8-pdr. is the heaviest gun that can be properly mounted for field use. Below these calibres the rapid fire gun will probably reign supreme and will displace the slower firing guns for all purposes. Whether this view will hold true or not the future must show, and their true position will probably not be fully determined until they have gone through the test of an actual war between some two modern and progressive nations. When the test does come, it is our opinion that this type of gun will speak for itself and will demand recognition in a manner which cannot be neglected or denied.

DISCIPLINE AND TACTICS.

BY CAPTAIN MOSES HARRIS, 1ST U. S. CAVALRY.

THE familiar story of the young corporal, proud of his position of responsibility, who says to his father,—drunk and disorderly in the barrack-room,—“Discipline must be preserved! Come with me to the guard-house, father,” whether true or not, shows that the enlisted men among whom it originated possessed a very correct conception of the power and dignity of military discipline. Discipline, indeed, is such an essential requisite to the life of a soldier that it is accepted as a condition of his existence, and its requirements, when properly administered, cease to be considered burdensome. The proposition that discipline is the vital principle, without which armies could not exist, is universally accepted as a self-evident truth which requires no argument for its support. And yet the very readiness with which this truth is accepted, and the preëminent place which we assign to discipline in the list of military virtues, causes us to fail sometimes to give it proper consideration in the discussion of problems presented by improvement in arms and the resulting tactical development, notwithstanding the close relationship which has always existed between discipline and tactics.

Discipline made possible that wonderful phalanx of the Macedonians with which Alexander conquered the Eastern world. It was the iron discipline of the Roman soldier which gave to Cæsar his invincible legions. That splendid fighting machine, the product of the martinetism of the half mad Frederick William of Prussia, in the hands of the great Frederick, gave to the world that system of tactics which, developing with the progress of military science, has lasted almost to the present day.

Methods of discipline have also developed in accordance with the advance of civilization and tactical requirements. The discipline of the stick which old Frederick William found so efficacious for insuring the steady and persistent march of his long columns, is not suited to the tactics of to-day, where, in the changing features of the combat, the lowest corporal may exercise responsible command, and where each soldier may be required to act upon his unaided judgment.

Under present conditions the serious question which presents itself is: How to cultivate and establish those habits of order, of respect for authority, of promptness and obedience which are essential to efficiency, without impairing the soldier's self-respect or destroying his sense of individual responsibility.

A backward glance at the character and methods of discipline in the "old army"—the army as it existed before the war—will perhaps, not be without some interest, and may serve to assure us that much substantial progress has been made during the past thirty years, even though that progress has been slow.

The recruiting service of those days was a drag-net which landed in the ranks of the army all sorts of specimens of the *genus homo*. The only requirements were those of a physical character, and the Bowery tough, jail-bird, and drunkard were accepted quite as readily as the run-away country-boy, or young man of good character and education who, tired of the monotony of a quiet and uneventful existence, was lured into the ranks of the army by the prospect of a life of adventure on the far western plains, then possessing the romantic charm of an almost unknown region. The latter class, while not predominating in numbers, acquired the influence which intelligence and manhood always command, and furnished, generally speaking, the non-commissioned officers. The scale of humanity as represented in the ranks had a somewhat wider range than it has to-day, while the average of character and intelligence may not have been widely different.

The low character of some of the men gave rise to offenses of a character so intolerable to the better class that they were frequently followed by sharp and severe punishment, inflicted by the men themselves without recourse to those charged with the preservation of discipline, or to lawful methods. An impromptu court, often presided over by a non-commissioned officer, would assemble, the culprit would be brought before it, and failing to make good his defense, would receive his sentence of a flogging, which was administered on the spot, coupled with the admonition that his reappearance in the ranks of the company would subject him to a repetition of the punishment. The following morning the man would be reported absent, and in due time he would be classed as a deserter. It can hardly be asserted that these proceedings received the approval of those in authority, but pursuit of the reported deserter was seldom ordered, and it appeared to be generally understood that the disappearance was for the good

of the service. These resorts to the methods of "Judge Lynch" were the logical sequence of the exercise of arbitrary power and the infliction of illegal punishments by the commissioned officers. Their immediate effect was often salutary, but a condition of discipline resulted which was widely different from the standard of the present day.

Flogging was only authorized by law as a punishment for desertion, but the isolation of the frontier gave rise to the exercise of illegal and unauthorized power, and the use of the lash as a punishment for theft or offenses of like nature was not unusual. Tying up by the thumbs, bucking and gagging, standing on a barrel, and the carrying of heavy weights were familiar and frequent methods of punishment. The administration of discipline was left largely to the non-commissioned officers, their superiors looking on and approving, satisfied to be relieved from a disagreeable duty. The first-sergeant was an autocrat within his sphere. His displeasure meant to the unfortunate soldier a life filled with bitterness and disgust. Even the captain deferred to his judgment, and was careful to give to him his constant support and approval, knowing that any failure in this respect would result in a tender of resignation and the consequent temporary disorganization of the company, involving much labor and trouble.

The pay was eleven dollars per month for infantry and twelve for cavalry, without increase during the first enlistment of five years, which, considering the difference in the price of labor, was probably quite as good as the present rate.

The clothing, although good, had not the variety of that at present issued and the allowance was less liberal.

The ration was insufficient even when the soldier received it all, and at the recruiting depots he was usually robbed of a large portion of it through the dishonesty of those charged with its care and issue. The recruit was in a constant condition of hunger, and always ready to drown his sorrows in drink or to indulge in any excess which seemed to promise momentary relief or forgetfulness to his wretchedness. After joining their companies the men fared somewhat better. The bond of common dangers and hardships created an *esprit de corps* which was a restraining influence upon dishonesty, and there was generally a hearty coöperation on the part of all concerned to make the best use of the supplies issued by the Government, for the common benefit. The ration was, however, scanty and lacking in variety. At a few for-

tunate posts a meagre and precarious supply of vegetables was raised by the cultivation of gardens; elsewhere they were only occasionally procurable and then were bought from the soldier's pay at exorbitant prices. Canned goods were unknown, and no long expedition was undertaken without numbers of men being afflicted with scurvy before its close.

This scanty and unwholesome food supply gave rise to a condition of the physical system favorable to intemperance and excesses, and eminently unfavorable to discipline. The sutlers charged extortionate prices for inferior goods, and the soldier, endeavoring to make good the shortcomings of the supply departments, frittered away his pay in the purchase of unwholesome varieties of food and drink or equally unsatisfactory articles of wearing apparel.

The prison rooms of the guard-houses were dreadful places, and no one who has been familiar with them can fail fully to understand the horrors of the Russian *kameras*, so graphically described by Kennan. The peculiar prison odor which he mentions—the product of filth and impure air—is at once recognized as the old guard-house smell. They were almost universally filthy and without ventilation, and often crowded to their utmost capacity. General prisoners serving long sentences were frequently confined in the same room with transient or garrison prisoners, and being usually men of depraved and desperate character, they usurped control over the interior management of the prison rooms, organizing a perfect reign of terror and subjecting new comers to every variety of indignity and outrage. They sometimes became veritable bands of thugs and robbers, and the unfortunate victim who resisted their extortionate demands would be beaten into a state of insensibility and afterward robbed. To men who possessed any sense of decency or refinement the guard-house was a name of fearful import, and yet no private was secure from finding himself an inmate of this dreadful place at the caprice of any non-commissioned officer. Once there his relief was a matter of chance depending upon the amount of venom injected into the report of the sergeant or corporal, the credulity or apathy of the company commander, and various other contingencies. In garrison this severe punishment of the guard-house was a constant menace to every private soldier and liable to follow upon the most trivial offense. The remoteness of frontier garrisons and the irregularity of mail service rendered resort to courts-mar-

tial comparatively infrequent. For light offenses summary punishment of the character previously mentioned was generally thought preferable to the tedious formality of the garrison court. When courts were convened their sentences were in keeping with the sentiment of the age, and were almost uniformly of a degrading character. The familiar sentence for desertion was "fifty lashes on the bare back, well laid on with a raw hide; to be indelibly branded on the left buttock with the letter D; to have his head shaved, and to be drummed out of the service." This sentence was usually carried into effect in the morning immediately after reveille. The troops were formed on three sides of a square, the prisoner and the group engaged in the execution of the sentence occupying the fourth side. The prisoner was stripped to the waist, and having been securely tied to a gun wheel, the field musicians—generally boys—were required to lay on the lashes, the officer of the day and the surgeon being in attendance, the former to see that the punishment was properly administered, and the latter to render his services should the failing strength of the culprit make them necessary. The severity of the punishment depended in very large measure upon the character and disposition of the officer charged with the execution of the sentence. None, however, escaped the horrible degradation of the infliction, which must have been quite as indelible as the brand of the letter D. It was formerly the practice to stamp the letter with a hot iron immediately after the flogging, but at the time of which I write the more humane method of tattooing the letter with India ink had been generally adopted. The whole process of the execution of these sentences was in the highest degree revolting to the large majority of those who were compelled to witness them and their brutalizing influence needs no further demonstration. To walk around a ring from reveille to retreat, carrying a log of wood or weighted knapsack, was a popular sentence with garrison courts, and ball and chain almost invariably accompanied confinement at hard labor. As the severity of such punishments is dependent in a large degree upon the physical condition of the prisoner, they were often wholly disproportioned to the offense committed. The ultimate effect of all these inflictions was to destroy the self-respect of the soldier as well as any pride or interest which he may have had in the military profession.

During the war, punishments for all minor breaches of discipline were almost invariably inflicted without recourse to courts-

martial, and were similar in character to those previously in vogue.

The necessity for some legal method of punishment for minor offenses more expeditious than that afforded by garrison or regimental courts led, in 1862, to the establishment of the field officer's court. The mistake was, however, made of requiring written proceedings in each case to be submitted for the action of the convening authority, with the result that commanding officers avoided the labor which was thus involved by a resort to arbitrary and illegal penalties.

In the first days of the war the high character of the volunteer soldiers rendered resort to punishments of any character seldom necessary, and it was only when the draft and bounty systems had filled the ranks with a less worthy class of men that we find any tolerance given to the harsh methods of the regulars. They were practised with zeal in a few regiments, but never became general throughout the volunteer service; and it is thought that the effect of the four years' association of the regulars and volunteers was, upon the whole, salutary to the discipline of the army, as tending to the introduction of milder and more humane methods and a better understanding between officers and men.

It must be confessed, however, that in the years immediately following the war there was a considerable relapse into the methods of *ante bellum* days. The wide dispersion of the army on the frontier, posts in many cases being garrisoned by detachments of one company or less for long periods, gave occasion, at times, for the exercise of authority in the interest of discipline not authorized by the regulations. These occasional instances, where the assumption of authority might have had some justification, have afforded excuse for much unnecessary exercise of arbitrary power, which has retarded the progress of the army towards a rational and consistent condition of discipline.

The revision of the Articles of War which was made in 1874 was an opportunity which might have been used to bring the discipline of the army into harmony with the advance of civilization, but the work was apparently performed with but slight conception of the true needs of the service, the abolition of the punishments of branding, tattooing and flogging being, humanely speaking, about all that was accomplished.

The improvement which has taken place in the conditions of frontier service has, however, exercised a more potent influence

in the interest of true discipline than could have been hoped for from any statutory enactments. The extension of railroads made possible the concentration of troops, thereby placing them under the command of officers of rank and experience, and making it much easier to assemble courts-martial for the trial of offenders. The advance of civilization in the West brought the troops into contact with a population which was accustomed to lawful methods of government, and it soon became evident that the public sentiment would not approve of harsh and cruel punishments or the illegal exercise of power. The operation of these influences has been so gradual as almost to escape our attention, but the progress has been steady and unwavering. One by one the old guard-houses of the type which was a disgrace to civilization have disappeared. A few perhaps remain hidden away in the obscurity of the frontier, but it is certain that their days are numbered. The pitiful spectacle of squads of wretched prisoners with their clanking chains working about the garrison and the quarters of the officers, has at least been softened by the removal of the irons. The sweat-box, the wooden horse, and other instruments of torture formerly considered necessary to the proper equipment of the guard-house, have been destroyed and so far forgotten that we are loth to acknowledge that they were once in common use. The extortionate and demoralizing post-traders' establishments have given place to the "canteen" which provides the soldier, under the intelligent and interested management of his officers, everything which can be procured for his comfort and enjoyment at the least possible cost. By the establishment of the summary court a means has been provided whereby appropriate penalties may follow promptly upon the commission of offenses, and the last vestige of an excuse for the infliction of illegal punishments has been removed. It may be hoped that the adoption of a uniform scale of punishments which may be inflicted by courts-martial will exercise a salutary influence upon the deliberations of these bodies and insure penalties justly proportioned to the degree of the offenses. There is still, however, much room for improvement, and it cannot be doubted that the progressive movement towards more humane and rational methods in the administration of discipline, at which we have so hastily glanced, will continue so long as armies continue to be a necessary adjunct to civilization.

The effect of punishment inflicted without the sanction of

law is seldom salutary. Although its justness may appear perfectly clear to the officer, the soldier persists in considering himself the victim of arbitrary power, and cherishes a feeling of enmity and vindictiveness against the one who inflicts it, believing him to be his enemy and oppressor. A desire to "get even," to "strike back," is engendered, which takes the form of further breaches of discipline; further punishments follow, until the unfortunate man seeks refuge in desertion or is sentenced to a long term of imprisonment for some serious offense. On the other hand, when the forms of law and regulations are observed, and just and reasonable penalties are enforced without prejudice or passion, each soldier perceives that he is a part of a system which is designed to accomplish certain results, and that his only hope for a happy and quiet life lies in a cheerful and prompt compliance with the established rules and regulations. And if by chance some unfortunate transgression is followed by its appropriate punishment, his self-respect is preserved by the reflection that no rank is so exalted as to exempt its possessor from the operation of the same inexorable system. A sense of personal responsibility and an appreciation of the dignity of duty is cultivated, and the soldier is benefited and elevated by his term of service. The more surely to accomplish this result, all idea of degradation should be disassociated from punishment for military misdeeds, and prisoners charged with neglects or purely military offenses should constitute a class entirely distinct from those guilty of crimes involving moral degradation.

Sentences of confinement for long periods should be, as far as possible, avoided; but confinement, whatever its duration, should never be allowed to interfere with the instruction of those men who are to be continued in service. Men guilty of offenses which degrade the service should at once be removed from contact with other soldiers, and should serve their sentences of confinement after being dishonorably discharged.

The character of the punishments adjudged should, as far as possible, be so adapted to the offenses as to exercise a corrective influence; that is to say, the reformatory idea which has been so successfully applied to the regeneration of civil offenders should be made use of in a military sense.

Most new soldiers find their daily work more or less irksome. The cleaning of arms and equipments in the preparation for inspection or parade, and the daily drills, are tasks which some men

are quite willing to escape from at the cost of a few days in the guard-house. Under our old system an indifferent soldier who desired to escape the labor involved in the weekly inspection, had only to absent himself from a roll-call, or commit some other minor offense which would result in his being sent to the guard-house. He would thus avoid the inspection and the labor involved in the preparation for it, and would, perhaps, be brought to trial and sentenced to a week's confinement, which would see him well past the following weekly inspection. In the meantime his arms and equipments would have remained uncared for, his instruction neglected, and he would have been a useless burden to the government which he had sworn to serve honestly and faithfully. The recent changes have greatly improved the old system, but even now a soldier's unauthorized absence for forty-eight hours may cost the government an additional loss of his services for seventeen days, and his drunkenness on guard the same loss of services, accompanied by the burden of his care and maintenance, for six months.

It will be difficult to devise any proper system of disciplinary punishments which will not impair to some extent the usefulness of the soldier during the period of their infliction; yet it is believed that the present methods are susceptible of much improvement.

The place of confinement of all men charged with military offenses should be a veritable reformatory, where all military instruction should be carried on with the utmost vigor. Instead of degrading the soldier by forced and menial labor, which has but slight value, and which imposes upon his comrades the onerous and disagreeable duty of following him about with a loaded rifle, the term of his restraint should be fully occupied in useful military exercises and instruction. He should take part in all the drills, parades, and inspections of the garrison; should turn out, neatly uniformed, at all roll-calls, and should keep his arms, equipments, clothing, and quarters in the neatest possible condition. In addition to the ordinary military work of the garrison he should be exercised and instructed in all sorts of military acquirements, setting up and other gymnastic exercises being given a prominent place. This disciplinary institution—it should not be called the guard-house—should be in permanent charge of an officer, having under him a sufficient number of non-commissioned officers and selected privates to insure restraint and proper

instruction, and should be governed by the strictest rules of discipline. This discipline should not be that of the prison or guard-house, but should be entirely military in its character, all idea of disgrace or degradation being carefully avoided. The soldier's ambition should be stimulated by a proper system of slight rewards for marked improvement, and suitable rebates in periods of confinement should be allowed for good conduct.

If it may be feared that such an institution cannot be made sufficiently punitive in character, we shall at least be assured that men who are frequently subjected to its discipline will not cease to be useful soldiers. It is, however, believed that under this system the military offender would rejoin his company at the expiration of his sentence improved and benefited by the instruction and discipline to which he had been subjected, and would resume his duties with his self-respect unimpaired. Can it be doubted that some such system would be an improvement upon our present methods, by which honest and conscientious men, for breaches of discipline and neglects due to faults of character and training, and involving no idea of criminality, are placed in contact with and degraded to the level of depraved criminals, to the destruction of their self-respect and their usefulness as soldiers?

The character of the daily intercourse between officers and enlisted men, and between non-commissioned officers and privates has an important influence upon discipline. Personal dislike and hostility, which gives rise to many offenses against discipline, can be as easily aroused by angry speech and manner as by unjust acts; and irritable and passionate commanding officers are very likely to have a poor state of discipline in their commands. A wise officer will, in his intercourse with his inferiors, sedulously cultivate a quiet and even manner and courteous bearing, and will rigorously school himself to avoid all displays of passion.

The captain is, in a military sense, the father of the company. He is responsible for the well-being of all under his command. All may appeal to him, and his decisions, to command respect, must be founded upon justice and sound sense. The character of the captain will be reflected in that of his company. During the long period of his identification with it the measure of his strength and his weakness will become fully known in the ranks, and his capacity for command accurately gauged. By frequent recourse to the military courts an incompetent officer may, in the

peaceful life of the garrison, or even under the stress of occasional and transient conditions of hostility on the frontier, preserve an appearance of discipline in his command, but that discipline which is necessary to meet the requirements of war, prolonged and bloody, must have a foundation more secure than fear of punishment. It must be based upon mutual confidence between officers and men. The soldier must have faith in the ability and judgment of his officer, and in the stress of battle must feel confident that his hope of victory and safety depends upon a prompt and faithful compliance with his commands in whatsoever manner they may reach him. The officer must possess the conviction that his orders will be obeyed and that his men will not fail him in the crisis of the combat, otherwise, no matter what his personal courage may be, his leadership will lack that confidence and vigor which is necessary to success.

This mutual confidence must also subsist between the private soldiers and the non-commissioned officers.

The system of group-leading, which is an important feature of the new tactics, must prove a source of weakness unless the corporals and sergeants are competent to command. That is to say, unless they are men of such superior ability as to be worthy of the respect and confidence of their daily associates.

In the armies of Europe, where the whole male population is subject to service, a wide field for selection exists, and no difficulty should be experienced in finding in the ranks a sufficient number of men perfectly qualified for these positions. In our army, recruited as it is by voluntary enlistment, the only inducements which can be offered to attract into the ranks men of the requisite ability to make efficient non-commissioned officers, are those of rapid promotion to the commissioned grade, or a rate of pay commensurate to the services which they are required to render. The chances of winning a commission under the present conditions of service are too uncertain to have much influence upon the supply of material for non-commissioned officers, and opinions will probably agree that the best interests of the service will not admit of any relaxation in the present conditions governing appointments from the ranks. That the present rates of pay of the non-commissioned grades are wretchedly inadequate, has long been acknowledged; and yet in all the various measures which have been from time to time brought forward for the benefit of the army the subject has received scant attention. The

reason may perhaps be found in the tacit acceptance of the idea that no legislation on behalf of the army which involves an increase in the annual expenditure for its support has any chance of success. That this is an erroneous assumption should be apparent from the very liberal appropriations which are annually made by Congress for the erection of handsome and expensive buildings at military posts, which, however desirable, are not at all necessary to the actual efficiency of the army. If there are any reasons for the continued existence of the army the same reasons will apply with ten-fold force to the necessity of keeping it in a state of efficiency, as money expended in the maintenance of a force which is likely to be found wanting on the day of trial is worse than wasted.

The whole subject of the compensation of the soldier has an intimate relation to discipline. A low and inadequate rate of pay will attract into the ranks of the army only the incompetent or the unfortunate and, however strict the scrutiny of the recruiting officers may be, it will be found impossible to maintain a high moral tone in the ranks under such conditions. Year by year the army is brought into closer contact with the people, and in the future is likely to find its chief usefulness in conserving the military knowledge of the nation and in educating by precept and example the citizen soldiers. To perform this work efficiently intelligence in the ranks is no less essential than in the commissioned grades. The National Guard will derive but slight benefit by association with regular troops unless the intelligence of the rank and file is such as to command respect. It should be remembered that the condition of all wage-earners has been greatly improved during the last twenty years. Not only have the hours of labor been much shortened, but the increasing culture of the cities and the activity of philanthropists are constantly affording new sources of entertainment and instruction for the masses and making city life more attractive. We can no longer hope to fill the ranks with intelligent recruits from the rural districts. Farmers sons no longer grow up on the farm and receive their education at the district school, but at an early age seek the cities and towns and the attractions which they afford. The demand for agricultural labor is largely supplied by the immigration of the peasant class from Europe, which is totally unfit material for American soldiers. The intelligence which is required in the ranks of the army cannot be improvised by the establishment of

post schools, but is a merchantable quality which must be paid for at its market value.

Not only should the pay of the non-commissioned officers be largely increased, but that of the private should be advanced at least three dollars per month, which, considering the improved condition of the working classes and the increase which has taken place in the relative price of labor since the present rate of pay was established, will be but a slight increase upon the inducements then offered. It is thought that the monthly pay of the corporals should be at least twenty-five dollars, and that of the sergeants forty, with an appropriate increase for first-sergeants and the non-commissioned staff.

The facility with which, under present regulations, men can secure their discharges when from any cause the service becomes distasteful to them, renders it vitally necessary that all serious causes of discontent shall be removed, otherwise the constant changes which will inevitably take place in the enlisted force will make the attainment of a high degree of efficiency difficult if not impossible. There is reason to believe that the increase in the soldier's pay which has been suggested is an essential adjunct to recent legislation, without which the benefits which have been hoped for will not be fully realized.

The almighty dollar is nowhere more respected than in this great and glorious republic of ours, and talk as we may about the honorable position held by the enlisted soldier, and the respect which should be paid to the uniform, the fact remains that everywhere men command popular respect in accordance with their outward and visible signs of prosperity, the ranks of the army not being excepted. The low place in the popular estimation held by the soldier in the ranks, is not due to any want of respect for the uniform or the profession of arms, but is based upon the conviction that a man who will surrender all his chances for success in civil pursuits to serve the government, with but slight hope of promotion, for thirteen dollars per month is a poor and incompetent creature who is not worthy of much respect.

It is time, however, to bring this somewhat rambling and discursive paper to a close. Its object has been to suggest the importance of bringing our daily intercourse with the enlisted soldier, and our methods of discipline, into harmony with changed conditions of service and the improvements in tactics, organization, and armament which are now in progress. If new tactics, new

arms, and a new organization are necessary to efficiency, it is believed that intelligent and self-respecting enlisted men are no less essential. With a proper increase in the rate of pay of non-commissioned officers and privates the intelligence will be forthcoming, but content and self-respect in the ranks can only be secured by a courteous and considerate treatment of the soldier and the abolishment of degrading punishments for military offenses.

REMINISCENCES OF TONQUIN.

BY LIEUT. F. DE T. CLOTH, FRENCH NAVY.

NEVER in my life did I feel more convinced that my pretty cousin was right in saying that "sailors ashore are a complete nuisance" than on that memorable day when I left my dear old gunboat in Hai-phong to do special duty ashore.

Before joining the column I had to remain one more day in that dirty, muddy and wretched town, the population of which consisted of one-half Annamese,—ladies and gentlemen whom I could never learn to distinguish from each other,—one-eighth Chinese merchants, and three-eighths French officers, sailors, soldiers, officials and tradespeople.

It goes without saying that whenever six French people settle down together in a savage place the first thing they do is to open a "Hotel Français." Hai-phong has its Hotel Français, and so I went there. I retired early, but had not been in bed for more than a couple of hours when what seemed a regiment of huge rats began to run all over my body, trying to make a meal of my ears. Their sharp teeth and the horrible sensation produced speedily drove sleep away, and there was, of course, no more for me that night. The dawn revealed to me that the brutes, not having been able to dine on French ears, had helped themselves to the soft leather tops of my boots. I know of no country where rats, tarantulas, scorpions, in short insects of every description, are so plentiful as in the Tonquin; whence they come I know not, but wherever a human being settles he is speedily visited by multitudes of the odious vermin.

There was no steam launch to take me down to Dap-Kau,—about eighty miles from Hai-phong and at that time almost at the outskirts of the pacified region of the Tonquin,—and being due in a few more days at headquarters I embarked on an old river junk. The little cabin aft in the junk was just big enough to allow me to crawl in and out on all fours and to permit me to sleep half doubled up. This, however, was preferable to living and sleeping with my crew, which consisted of sixteen Annamese coolies, each of them dirty beyond description.

I had a boy who accompanied me and whom I called "Revolver." Apart from being proud to hear this name and to serve me, he spoke French fairly well and had under my direction learned to cook quite a decent meal. During the first few days of my voyage I had little or no distraction except the shooting of wild duck, snipe and divers, which abound all along the Red River. The second day passed and I saw on all sides the traces which war inevitably leaves behind it. Here were villages, surrounded with thick bamboo hedges serving as fortification and with wild banana trees inside, destroyed by fire and abandoned. There was no living soul near to gather the fruit. All the houses here are made on the same model,—of banana frame-work, covered with rice straw and palm leaves. The deserted Buddha temples which we passed were massive brick structures, but their gods were broken and their altars in ashes.

The third night we passed the Elephant Mountains, the only set of rocky hills in the so-called Delta of the Red River between Hai-phong and Dap-Kau. Caves are to be found in them in great numbers, and though they are situated in the pacified region they were nevertheless infested with pirates. The Chinese pirate is cruel, bloodthirsty, treacherous; he knows of nothing and cares for nothing but plundering. The morning had just dawned. The sun was still struggling with the fog that had settled down during the night on the broad valley and the lazy and muddy waters of the Red River. I was sleeping very lightly and instantly heard my boy when he began to scream: "Ça! pirates! Monsieur! Monsieur! pirates! pirates!" Like a shot I issued from my cramped-up bed-chamber and jumped to my feet, gripping my Winchester and satisfying myself that I had my revolver, for it was my habit to sleep in arms. Standing on the covering mats of the junk I could see nothing at first, but soon detected a very doubtful looking, old and dilapidated junk rapidly nearing ours and already at a distance of not more than a hundred yards. My coolies left their oars in their hooks and at once tried to find a hiding corner in the interior of the boat, where they huddled together and began screaming and trembling. All my threats to shoot them down were of no avail and I felt that I had to defend myself and my brave crew alone. Suddenly a shower of good sized stones hailed down on the junk. In the meantime the pirates had approached within fifty yards and the fog having now almost vanished I could plainly see the wild look-

ing brutes I had to face. I shouted, "halt!" leveled my Winchester, and in answer received a volley of five or more shots, not into my body but into the boat. As there was no hope of escape there was nothing left for me but to return the fire, and the first, second, third, fourth, fifth, sixth, seventh and eighth shots brought down a man each. I do not know who was more impressed by the slaughter, my enemies, my coolies or myself. This much is certain that my men, seeing what I had done, jumped on deck, took up their oars and followed my orders to run straight to the enemy. There were altogether about sixteen pirates on the boat, but before we were able to reach them those who were not killed jumped overboard, and diving like wild ducks, gave me no chance of capturing them. When we boarded the junk we found plenty of food stored away and about 600 piastres in cash. The fire-arms on board dated from forty to sixty years back, all being in very bad condition.

We made haste for the next French settlement on the river banks, where I reported the occurrence and delivered my prize and the money found to our own civil authorities. I received little thanks for this, and had the "Resident" had his way I would have been shot for murder the next morning. Civilians ought never to have anything to say in a savage country where a war is raging. They deem themselves always wiser and claim to know more of the country and the people than any military or naval officer, no matter what his experience may have been. However, "Monsieur le Resident" did not have his will, and I am still alive to the great annoyance of that most humane official. The rest of my journey passed without further adventure.

When I arrived at Dap-Kau I found further orders awaiting me to proceed at once to Phu-long-thion. I was glad to leave the dirty junk and most anxious to reach the place of action in order that I might see a good regular fight with the Chinese soldiers on shore. In Phu-long-thion I found the correspondents of the *London Standard* and the *Times*, and they were anything but pleased with their situation, as the Commander-in-chief had not only checked their curiosity, but had confined them to a territory where their lives were at least safe. In another day I arrived at Kep, but was too late for the fight which had taken place a week or so before, and in which the Chinese had lost their last hold in the Delta.

After having reported myself, a few more days of miserable

life followed. Between Kep and Phu-long-thion a field telegraph had been established to maintain connection between the different columns and the principal towns in Tonquin. The inhabitants of the surrounding villages, however, were not only greatly annoyed by the wires, but they had become tired of furnishing poles, and each day brought us the news that during the night the wires had been cut by unknown persons. We repaired them as long as our patience lasted, and when, notwithstanding all exhortations to the native chiefs to leave the wires alone, the nuisance still continued, the General decided to make an end of it. Orders were therefore given and distributed among the chiefs and inhabitants that in future the former would be held responsible for any repetition of the offense, and that if they did not hand over the guilty persons the officials would be shot. The warning was of no avail, however, for the next night the wires were cut again. Two officers and a platoon started at once for the nearest village, where nobody, of course, knew who the culprits were, and no one seemed to care. When we asked the mayor and his assistant to come with us and said that this would be their last day on earth, they simply smiled and shrugged their shoulders and followed outside the village as if they were going to a feast. Beside the families of these officials half the village followed, laughing and chatting. Never in my life had I seen men led to their death behaving with such composure and indifference. The same unconcern shown by the two chiefs was also manifested by their families and by the inhabitants who followed them. Once more we asked through our interpreters for the surrender of the guilty persons, but in vain. Then, the platoon was formed and *Monsieur le Maire* stood there facing the leveled rifles with an expression that meant, "What do I care?" At the word "fire!" ten bullets tore open his breast, but the corners of his large mouth still showed a contemptuous smile. Not one of his family or of his followers uttered a single word, and the only expression their faces showed was wild curiosity. We had hoped this terrible example would have its effect on the mayor's assistant, but it did not. He followed his chief to death with the same contemptuous stubbornness. The rigorous punishment by no means stopped the cutting of our telegraphic communications, and many more natives had to be shot before the nuisance was stopped.

It is perhaps not out of place to give here an idea of the atrocious cruelty to which the Chinese resorted whenever one of

our men fell into their hands. One day, I remember, a private soldier was found pinioned to the ground with pointed bamboos which were driven through the palms of his hands, his feet and breast. Several sensitive parts of his body were burned with unslacked lime. In the face of such terrible atrocities it can surprise nobody that our men did not always treat their enemies exactly according to the rules of the Geneva Convention. The Christian charity of the red cross was not known in these distant parts of an uncivilized world where the cross was only a sign of unbelief.

After the fall of Kep the remainder of the Chinese army had taken strong positions in the rocky mountains behind them. Our plan of operations was to chase them to their own country, and as more than two hundred kilometres were still lying between them and the "Porte de Chine," our task was by no means easy. No time was lost, and the Lang-son column was formed at once. We left a strong post at Kep and then gathered around Lam and Chu, which became the basis of all operations. The memorable Lang-son march then began, and from January 31 to February 13 each day brought bitter fighting, enervating fatigues, and the most bitter privations to everybody from the General to the last soldier.

The first day we did not see anything of the enemy. The second day, however, after having passed the "Col de Deo-vang" the outposts of the pig-tailed Imperial army were sighted for the first time, but they retreated in haste. We were now in a region where there was neither vegetation nor houses, and absolutely nothing but isolated, bare rocky hills from 300 to 500 feet high, which were occupied by detachments of the regular Chinese army. All the food, which consisted of biscuits and rice, had to be carried by coolies.

No one who has not witnessed such an expedition can imagine what it means to move an army of several thousand men in a mountainous desert where there are no roads and where the troops often have to march in single file when passing on the verge of abysses 400 feet deep. It is a mistake to suppose that in a war of that kind the principal care can be devoted to food. First comes ammunition and next come provisions.

When we camped the following night thousands and thousands of crows and black-birds camped with us, for they had now become our faithful companions. They rose with us and went to

rest with us for the prey that death would afford them, whether man or beast. When we halted the rain came down in torrents and dear old Colonel Colville, of the *Times*, unpacked all his India-rubber blankets and tried to make himself comfortable. Four bamboos were driven into the ground, to the ends of which India-rubber blanket No. 1 was carefully fastened to form a roof, under which he lay down wrapped in India-rubber blanket No. 2. "Splendid idea, isn't it?" he asked me. "Marvellous!" I retorted, lying there on the bare mud-covered stones with the rainy clouds as my cover. All was quiet in our camp and sweet slumber had just captured our senses, and dreams of all the luxuries of the Paris boulevards had stolen into our brains so that hope should help us bear the cruel reality, when all at once an avalanche of water flooded me. The rain had filled the hollow of poor Colville's rubber blanket No. 1 and one of the bamboos giving away had caused the contents to be poured not only over Colville but over all those around him. I could not see, but could well imagine the pitiful face that the good old Colonel must have pulled when, notwithstanding all his precautions, he got so unexpectedly drenched to the skin. The rain continued and for weeks to come not one of us had a dry thread on our bodies.

A few more days passed before we could force a fight upon the Chinese. At Dong-son, however, matters changed. The place was high and well fortified, lying on an isolated rock, and could not be avoided if we wanted to push further. The fight began early in the morning, and as the Chinese were not only numerically stronger but were regulars, commanded by a good many American and other foreign officers, the engagement was severe. It was here that poor Lieutenant Prince Ruspoli said: "*La croix ou la mort pour moi avant ce soir.*" Before the evening shadows fell upon the blood-drenched battle-field poor Ruspoli was among those who at the head of their men gave their heart's blood for the honor of their country. Peace be with thee, dear friend. Among us who survive thy laurels cannot fade.

Having had a very narrow escape from getting the wooden cross instead of any other cross myself, I found that it was erroneous to believe that the Chinese are poor fighters. Most of the men I saw were strong, strapping fellows from five feet eight to six feet tall and stood like a wall against our assaults. The regular Chinese soldier is trained after European fashion and will stand fire like a rock. In fact, he is indifferent to rifle bullets

but dreads cannon and cold steel. We had some mountain artillery with us but the ground was such as not to allow us to bring it much into action. As I have said, the Chinese soldier does not mind being shot at with rifles and consequently all their positions had to be taken by assault, which always means a great loss of life. The place had to be captured step by step, and whenever a Chinese soldier fell into our hands alive he would invariably kneel down and show his bare neck, which meant, "Cut my head off." I had occasion to see later that our captured soldiers had to undergo this cruel punishment, for which purpose the Chinese carried a long cup-cup with them. Even our fallen comrades were not spared. The Chinese, like the Arabs, do not believe that a man is really dead unless his head is severed from his body. Our men often preferred to kill themselves, if there was no escape possible, to falling into the hands of the heathens.

The next great battle took place before Lang-son, which, being situated in a valley, allowed us to bring our small force of mountain artillery into action. Several thousands of the enemy fell here and before we were able to bury them all we received orders to push forward and drive the remainder back to the *porte de Chine* and into their own country. In doing this we found little resistance, but we suffered terribly from want of food and often ran short of ammunition. We were all glad that the war in this part of Tonquin was practically ended. Those of our men who were not dead suffered much from enæmia and dysentery, both of which are plagues of this country. The plan of operation now was to return to Lang-son and to take strong position there; consequently we fell back.

Two days had elapsed, when, on the dawn of the third and after the mist had cleared, we saw all the surrounding hills covered with regular and irregular Chinese soldiers and black flags. The enemy was evidently preparing for a crushing attack. We took such a position as would enable us to retreat safely. The enemy numbered some 35,000 men and had evidently been strongly reinforced, while illness and bullets had melted our little corps down to about 18,000 men. The Chinese formed their columns immediately and to the outlandish din of the tom-tom made a vigorous assault. Not a single shot was fired from our side until they had approached to within 300 or 400 metres, when they received our first greeting. Shrapnel and infantry fire drove them back as quickly as they had come. However, they had more

pluck than we expected and continued to assault us at intervals all the day long, but were repulsed each time with great slaughter.

Late in the afternoon the Chinese commander tried to cut off the retreat of a part of our forces by an attack on our flank and rear, and succeeded in severing a company of the 111th from the main body. Only a few among them escaped, among them Lieutenant de Colomb, who joined us at midnight with a smashed leg, crawling on hands and knees over the rocky ground. Brave Captain Cutter, who was an Irishman serving in the foreign legion, fought like a lion that day until his body was riddled with bullets.

It was a terrible night that we passed and there was a terrible awakening the next day. In order to cover our retreat on Lang-son we had to fight all day against an enemy thirty times stronger than ourselves. Worn out, with no food, death stared us in the face from every hill. The climax of our bad luck was reached when our gallant General de Negrier was shot through the abdomen. The command then passed to Colonel Herbinger.

This officer ordered what is known as the "Lang-son retreat." The man is dead now and *de mortuis nil nisi bonum*. Although many of us were wounded and fatigue and hunger had greatly exhausted us, no one who knows de Negrier will doubt for a moment that had he not been wounded the history of the campaign would bear no record of such disaster as the Lang-son retreat must be regarded now.

Comment and Criticism.

(The remarks under this head have, generally, been invited by the Publication Committee, which desires that, as far as practicable, these "Comments" should appear under authors' names.)

I.

"The Magazine Staff and Ammunition Service in a Sea-coast Fort."

Lieut. C. D. Parkhurst, 4th U. S. Artillery.

CAPTAIN CHESTER'S article with the above title was read with a great deal of interest, and I would like briefly to invite his attention to something he failed to mention, that possibly may simplify matters somewhat, and make the service of the heavy ammunition, and the number of men necessary for such service, a different matter from what he gives it.

I think it "goes without saying" that a sea-coast fort will fail in one of its most vital points if it is not thoroughly equipped with the dynamo and the electric light. Certainly we will have as much need for the search light as any one, the most successful method of combatting the search light of any enemy's vessel being with search lights of our own. Then too, we will need it for many other purposes, and besides this will need to have lights here, there, and everywhere, for the service of guns and handling of ammunition at night, and no safer, better or cheaper light can be had than the incandescent electric lamp.

Granted then that the dynamo is an essential feature of a modern sea-coast fort, it would seem to follow as a simple corollary that the best and simplest power we could use to propel ammunition trucks would be the electric motor instead of man power. The railway that Captain Chester describes could be made into an electric road, either surface or underground, depending upon the circumstances of site, etc., etc. Each truck could be provided with its motor so as to be independent and ready and able to move without waiting for a special electric locomotive, and then only one man would be necessary at the most for each truck while in motion, he being the truck driver and manager simply for starting and stopping.

That the service could be made safe is beyond all doubt. That it could be made certain and reliable is within the bounds of reason. If it should break down from any cause, the trucks and track would still be available for man power as Captain Chester describes.

The same power, or source of power, could also be used for any and all ammunition hoists or lifts that might be needed, and the service be thereby much better and quicker done than by any hand power, to the great saving of the men. As yet no apparent demands have been made by us upon the electrical engineer for any development of electrical science for war purposes except in the way of our telegraph and submarine torpedo system. We of the army have made no demands for special apparatus or

appliances for electric light or power ; and yet it can reasonably be assumed that should the demand be made it will be promptly and surely met in a safe, reliable, and thoroughly satisfactory manner. Our electric engineers are the peers of any, and but wait the demand to provide anything needed that can be supplied in the present state of the art.

With something like 500,000 horse power daily and nightly in use in this country to produce the electric current for light and for power ; with almost 400 successful electric roads in daily use ; with 95% dynamos, and 85% to 90% motors, it would look as though we have only to make our wants known to have what we want at once and to be able to transmit light and power anywhere throughout our forts, either to move ammunition trucks, actuate motors for hoists, furnish any number of search lights or light in any amount for other purposes, or even to handle our heavy guns in a thoroughly efficient manner.

II.

"Mounted Infantry."

Captain J. F. Stretch, 10th U. S. Infantry.

THE JOURNAL OF THE MILITARY SERVICE INSTITUTION for November, 1891—contained an article by Lieut. J. A. Penn, 13th Infantry—in which he ably presents his views upon the subject of Mounted Infantry.

In this article there are many points which will attract the attention, and it is hoped, careful consideration of all officers, and particularly those belonging to the infantry branch of the service.

The subject of Mounted Infantry has been occasionally brought forward but not in the prominent manner now presented to its readers by the JOURNAL in its publication of Lieutenant Penn's essay. Officers who saw service in the Civil War, have frequently mentioned the good service done during that war by Mounted Infantry regiments (volunteer regiments armed with the Spencer Rifle) and have given instances to mention which would take up too much room for the purposes of this note. Of the instances since the war, that in which the 5th Infantry established such an enviable reputation is remembered by all.

It goes without saying that mobility is a great desideratum. In the past, efforts were made to increase this requisite, and in the future, with the prospective armament, mobility is, if possible, still more important.

A few regiments of infantry mounted would be of great utility no doubt, but to do away with the good old infantryman whose first care is his rifle, the next himself, and in whom there can always be placed perfect confidence whether he be behind breast-works or in the open, would, in my opinion, injure the service.

It is evident that all Mounted Infantry should be composed of young and athletic men, those who, after riding long distances will still be able to take up the offensive on foot.

Much better would it be to arm the cavalry with long rifles than have the infantry degenerate.

Anything better than horses as means of transportation (railroads seldom run to the exact point where troops are needed) has not yet been discovered. Recent experiments abroad have shown the horse superior to bicycles for courier duty.

Bicycles or tricycles, as a means of rapid transportation in the greater portion of Mexico, in case of trouble with that neighbor, would not I think, be of very great utility, and it is strongly suspected that if taken, they would soon be abandoned.

Of the means of transportation for mobility mentioned in Lieutenant Penn's arti-

cle, wagons would probably, at first thought, be favored by the majority of officers, but let us examine some of the reasons for selecting wagons in preference to horses. More economical? True. Will they accomplish the same work, and as expeditiously? Doubtful. Can infantry in wagons work independently of the cavalry even when the country is passable for wagons? Lieutenant Penn very judiciously says that for carrying on reconnoitring, advanced guard, and kindred duties, infantry so mounted, "cannot be considered." However, a few men mounted on horses or mules would, I think, under such circumstances, by acting as scouts, enable the command to move rapidly through an enemy's country. This, of course, refers to Indian warfare.

Until some other transportation for mobility of infantry is discovered, in the use of which infantry can act with the other arms of the service, and also independently, the conclusion must be reached that, at present, the horse is the superior means.

Captain George S. Wilson, 12th U. S. Infantry.

I think Lieutenant Penn errs in admitting to consideration the feasibility of using wagons for a mount. True, opportunities might sometimes occur to move bodies of infantry quickly to distant points by their use, and to decide the fortunes of a campaign by that means. And wagons might be so constructed as to travel upon any excuse for a road. But if Mounted Infantry has a place in war, it is useless, worse than useless, to consider any mount other than riding animals.

In the first place, infantry in wagons would not be "Mounted Infantry," in the sense of a rapid-moving fighting force for any and all points on the field of battle and in strategical moves, much less in screening and reconnoitring duty. It would lack flexibility. Another objection would be its monopoly of roads to the inconvenience of passing troops, especially artillery. Supposing, though, that wagons would answer the purpose. What would become of them in times of quiet?

The conditions of modern warfare render it essential to the highest efficiency of an army, that a part of the forces which *shoot hard* should be given greater mobility than it is possible for the human leg to furnish, to enable it to be here, there and everywhere, and with the power to hold on like a bull-dog—not merely to snap and jump back like a greyhound. Cavalry has the speed of the greyhound, infantry the tenacity of the bull-dog—mounted infantry combines both qualities. And there is no nation on earth better able than ours to furnish the men and the horses for such a force. Its various uses have been pointed out, such as, turning movements on the field of battle (which are now required to be made on the arc of a larger circle than formerly); for quickly seizing and holding distant points; screening and reconnoitring duties in conjunction with cavalry, and so on. "And holding" are suggestive words in the last sentence.

Rapidity of movement covers a multitude of errors. Forrest, pronounced by General Sherman to be one of the most remarkable developments of the late war, although uneducated to such a degree that he could scarcely spell "science," epitomized the secret of the success of his remarkable career as a leader of mounted troops, when, in speaking of his distinguished opponent, General J. H. Wilson (who had been in the corps of engineers), he said: "I'll give him all the 'science' if he will let me have fifteen minutes start." Did General Forrest know he was appropriating to himself the real science of war? The art of "getting there first."

Mounted Infantry fits in here. It could "get there first," and when it got there it could stay. Its fighting power is greater than that of cavalry in the ratio of the relative effectiveness of the rifle and carbine—plus the advantage of being unencumbered by weapons useless to a man fighting on foot—plus the confidence of a man fighting

by his own methods with a weapon which he knows is the best, as compared with a man fighting by another's methods with a weapon which he knows is not the best—plus the benefit of the sympathy and encouragement of the whole army of infantry, which he knows stands ready to applaud him because he is one of their own arm, who has invaded, so to speak, the province of another arm, and (in the infantryman's enthusiastic mind), can do more execution than that other arm.

To fulfill its real usefulness, mounted infantry should be in large force. It should be used, first, as a fighting force mainly at points too distant to be reached by foot troops. Second; in screening, reconnoitring and raiding purposes, in conjunction with cavalry. It would increase the effectiveness of these last named duties by relieving the cavalry of the necessity of fighting on foot and by furnishing the aggressive or resisting power of the two arms combined. With such a command, horse artillery would work with confidence.

The mounted infantryman must understand from the start, that his horse is simply a means of rapid transit, and that his fighting is to be done on the ground. He should understand that when he dismounts to fight in real battle (not so on outriding duty), his business of the hour is with his rifle, and that, for the time being, he has no horse. The fight over, he may turn his thoughts to his horse, and if he finds it, so much the better. But if, in the meantime, his general has deemed it of more importance to help whip the enemy than to take care of the mount,—if it so happened that he couldn't do both,—that, also, is so much the better. Five thousand mounted infantry should not gallop ten miles to a vital point on the flank or rear of the enemy, to worry over their horses. They should go there to fight.

Mounted Infantry would require but little special training except in "plain" riding and the care of animals. "Mount," "Dismount," "Fours right," etc., comprise nearly all the necessary formal commands. The force should be specially recruited in riding communities and care exercised in the selection of men and officers to see that most, if not all, of each company had knowledge of riding. It is in the preparation of mounted troops that Mounted Infantry would find one of its chief advantages. To train a cavalryman is the work of time. Mounted Infantry could take the field with efficiency much sooner. In these days of machine fighting, "time and tide—and war—wait for no man."

Lieutenant Penn quotes no less an authority than General Merritt as saying that "Mounted Infantry would never become cavalry, and might degenerate into very poor infantry." As I understand it, there is no advocate of Mounted Infantry who would willingly allow it to become cavalry. The functions of the two arms are different although they may often blend. As to the force degenerating into very poor infantry, I do not think the experiences of the late war would justify that prediction, nor do I think the suggestion well founded on the philosophy of human nature.

As intimated above, Mounted Infantry would have the moral support and admiration of the great body of infantry, which in numbers and voice overwhelms all others. General Hooker might have bankrupted himself by his offer of a thousand dollars for a dead cavalryman. Yet,—right or wrong—it took a Sheridan, a Merritt, a Torbert, and others, a whole year to fight that slur out of sight, and it isn't dead yet. If the facetious sentence had been aimed at the infantry of the Army of the Potomac—right or wrong—it would have fallen flat, simply because there would have been none to laugh.

"Mounted Infantry" would be "infantry," a part of the great mass whose voice overwhelms and controls sentiment. The infantry would sustain its own and set it up as a friendly rival and superior of that other branch of the service which does not belong to infantry. The mounted infantryman would feel this, be proud of it, believe

it for that matter, and be on his mettle to sustain the reputation. This is not altogether a deduction from a study of the abstract subject. It is from my own observation, as a member of Wilder's Brigade of Mounted Infantry, in the Army of the Cumberland. The admiration and moral support given that brigade by its brother infantrymen, was a real power worth many guns. But when so distinguished an officer as General Merritt expresses an opinion on a subject in which he is recognized as an authority, it is well for one who takes the responsibility of differing with him to look well to his grounds. Therefore I wish to fortify myself by quoting examples.

Wilder's brigade consisted of infantry regiments selected for mounting after they had been some time in service. The brigade was mounted on animals (horses and mules) taken from the enemy's country just as found. That is, neither men nor animals were specially selected. This was early in 1863. June 24th of that year, the brigade opened the Tullahoma campaign by taking and holding Hoover's Gap against odds of six to one. From that day on till the middle of October the brigade performed the most arduous services in marching, fighting, raiding, scouting and all duties pertaining to mounted troops, besides taking its full share in the battle of Chickamauga. In this campaign of over one hundred days, it rode full fifteen hundred miles, lived off the country half of the time, and prodded Bragg's army in more places, and gathered more useful information than any mounted brigade in the Army of the Cumberland.

But let the Rebellion Records speak (Vol. xxx., Part 1, page 446, Colonel Wilder's report):

"I immediately made preparations for battle, and, advancing in line, found Pegram's force drawn up in line of battle, occupying a high wooded hill to the south of Leet's Tan-yard. I immediately attacked him. Being unable to use my artillery on account of the woods, my left flank was now attacked by a force under Armstrong, while the force in our rear pressed us closely. With two regiments I boldly attacked Pegram, driving back towards Lafayette the other two regiments holding my rear and left flank. On our right, toward Pea Vine Church, a brigade of Rebel infantry under General Strahl occupied the road towards Gordon's Mills. Leaving a strong line of skirmishers facing the rear, left and front, I, with the remainder of the command, charged Strahl's command, driving back his left and opening the road to Napier's Gap in the Pea Vine Ridge, safely withdrawing my command by that route and joining General Crittenden at midnight. * * *

"On the 18th, at 10 A. M., we were attacked by a brigade of Rebel infantry, but our position being a strong one, we repulsed them easily. Colonel Minty being at Reed's Bridge, two miles below, with a brigade of cavalry, sent a pressing request for help. I sent Colonel Miller with the 72d Indiana and seven companies of the 123d Illinois, and a section of the 18th Indiana Battery to his assistance. Soon after, three brigades of Rebel infantry attempted to carry my position. We repulsed them, however, with severe loss to them. At 5 P. M. a picket stationed in my rear reported a strong force of Rebel infantry in my rear. Having driven the cavalry away from a ford below me I immediately commenced withdrawing. * * *

(R. R. Vol. xxx., Part 2, page 251. Report of General Liddell (Confederate) commanding division.) "I was ordered to take Alexander's Bridge. * * * The force in our front consisted of Wilder's Mounted Infantry, from whom we captured half a dozen or more breech-loading rifles. Our loss was 105 killed and wounded, and I can only account for this disproportion from the efficiency of this new weapon. * * *

(R. R. Vol. xxx., Part 2, page 528. Report of General Pegram, Confederate cav-

* Alexander's Bridge. W.

alry division.) " * * The second engagement with the enemy was on the 12th inst. (September, 1863), near Leet's Tan-yard, where we fought for two hours Wilder's Lightning Brigade of Mounted Infantry. My force in this fight was the 6th Georgia and Rucker's Legion. It would be impossible to pay too high a tribute to the daring gallantry of my small force in this unequal conflict with the picked brigade of General Crittenden's * Corps. For a time the fight was almost literally hand to hand. I was forced back only about 400 yards. * * My loss in this fight was about 50 killed and wounded. * *"

(R. R. Vol. xxx, Part 2, page 727. Report of Colonel Hodge, Confederate Cavalry brigade, Davidson's Division. Wheeler's raid.)

"October 7th * * * I was proceeding at a gallop with my command, back, when, ahead of me, I encountered the whole of Scott's (Confederate. W.) Brigade, crowded in frightful and horrible confusion, wild and frantic with panic, choking the entire road and bearing down upon me at racing speed. * * they rode over my command like madmen. * * I was ridden over and my horse knocked down. *

* * For five hours and a half, over seven miles of country, the unequal contest continued. My gallant brigade was cut to pieces and slaughtered. I had informed the officers and men that the sacrifice of their lives was necessary and they manfully made the sacrifice * * At 3 P. M., with my bleeding and almost annihilated brigade I had formed my last line, the welcome order came from General Wheeler to fall back. * *"

At no time did Scott and Hodge have more than two of Wilder's regiments and a few of Long's cavalry opposed to them. All this was merely preliminary to the battle of Farmington which took place later in the afternoon, and when Wheeler had three divisions,—Davidson's, Martin's and Wharton's. General Crook had (present) two brigades and in his report says (R. R. Vol. xxx, Part 2, page 687) " * * At this moment my infantry † making a charge, broke through their centre, scattering them to the right and left, capturing four guns * * I learned here that I fought General Wheeler with his entire command. * * My loss in the entire trip was 14 killed and 97 wounded. * *"

Of Crook's loss Wilder's Brigade sustained (mostly at Farmington) 13 killed—including one colonel—and 79 wounded.

The above quotations refer to only a few of the numerous engagements of the brigade in the campaign of 1863, but I think they fully establish the claim of staying qualities, as instance Hoover's Gap and Alexander's Bridge.

The brigade's loss in killed and wounded in the campaign averaged 56 per regiment, and its missing three per regiment. The eighteen cavalry regiments in active service in the same campaign lost, in killed and wounded, 15 per regiment, and 17 per regiment missing.‡ When it is explained that with the exception of successfully resisting heavy lines at Chickamauga, September 19th–20th, all the brigades fighting was on the offensive, sometimes,—as at Hoover's Gap and Farmington,—against great odds, * * * and that it was successful and victorious fighting, the significance of these figures is plain.

On the Atlanta campaign of 1864, Wilder's brigade had its full share of work.

In March, 1865, the brigade started on its final campaign as a part of General Wilson's twelve or thirteen thousand mounted troops, on the Selma Raid. April 1st the brigade helped whip Forrest at Ebenezer Church. The next day it helped capture

* General Thomas'. W.

† Wilder's Brigade, Col. O. A. Miller, 72d Indiana Vols., com'd'g. W.

‡ Losses taken from Rebellion Records. They may not include quite the whole period of the campaign but complete lists will make no material difference.

Selma, thirty-two miles distant. Of the capture of Selma, General Wilson, in his official report says: " * * * The distance which the troops charged, exposed to the enemy's fire of musketry and artillery, was six hundred yards.

" * * * The loss in Long's division (to which Wilder's brigade belonged. W.) was 40 killed and two hundred and sixty wounded. * * * I doubt if the history of this or any other war, will show another instance in which a line of works as strongly constructed and as well defended as this, by musketry and artillery, has been stormed and carried by a single line of men without support." This charge consumed between fifteen and twenty minutes' time.

I do not know what portion of Long's loss was sustained by Wilder's brigade, but that of one of its regiments † was 92 killed and wounded, and on the whole Selma raid the same regiment lost 115 killed and wounded. The other regiments of the brigade also lost heavily.

This campaign took place over two years after the brigade had been mounted, and the command was never in better condition, in discipline and in fighting trim than the day it galloped into Macon, Ga., at the head of Wilson's forces, there to learn that the war was over. This bit of history is introduced for the double purpose of showing that Mounted Infantry does not degenerate, and to show its general usefulness and fighting qualities.

The leadership of Mounted Infantry is an interesting study. He who commands should be full of energy and resource, and should know intuitively when to use his horse's legs and when to use his men's rifles. In this connection it is interesting and perhaps instructive to note, that in the late war most of the successful leaders of mounted troops were without previous special training with that arm. Sheridan, Crook, Torbert, from the infantry, Forrest from citizen life, and Wilson, Merritt, McKenzie and Custer, too short a time out of the Academy to have a special training in any arm.

Give us Mounted Infantry. And let us thank Lieutenant Penn for his able advocacy of it.

Captain P. H. Ray, 8th U. S. Infantry.

Lieut. Julius A. Penn's able article on Mounted Infantry, which appeared in the November JOURNAL OF THE MILITARY SERVICE INSTITUTION, is valuable in showing the necessity of an efficient corps of Mounted Infantry or riflemen; how little has been actually accomplished in supplying our army with this essential adjunct, and what slight attention has been paid to the important lessons given by such men as Generals Miles, Merritt and others by their utilization of such means as they had at hand to meet emergencies forced upon them.

As to how the alleviation of this necessity may be brought about, Lieutenant Penn has but few practical suggestions to offer, and as it is a practical and not a theoretical solution that is called for, I venture to propose a few plans as to one of the means now available and which the Government is liable to lose through a lack of the proper appreciation of the element with which it has to deal.

The enlistment of Indians as now authorized by the President, if carried out on the broad, liberal lines laid down by the Major-General commanding the Army in his letter of May 7, 1891, would fully supply our little army with the best material for the most efficient corps of mounted riflemen in the world, provided these lines were carried one step further and the plains, or horse, Indians permitted to keep their ponies, without which they are more than unwilling to enlist.

* Twenty per cent. of the force engaged.

† 17th Indiana.

I believe I succeeded in obtaining the first company of infantry from among the (horse) Indians. It is made up from the Arapahoe and Shoshone tribes, and from my experience, not only with these people but with the Sioux, Apaches and others, I am well satisfied that every company of infantry now authorized could be filled in a short time with the best class of young warriors, under such conditions as would allow them to retain their ponies while in the service, and this could be done in the following manner with but slight expense to the Government.

1st. Let them be enlisted to serve on foot in time of peace, to go wherever and whenever required, on foot if necessary, but to be mounted on their own ponies in time of war or on practice marches.

2d. That each Indian shall keep himself furnished at all times with one serviceable pony ready for war, and that he shall be allowed to own and keep on the range as many more as he sees fit.

3d. That he shall be furnished with a ration of hay for one horse in time of peace, and that when ordered out mounted he shall receive 40c. per diem for the use of his horse, and if mounted for 100 days the horse shall become the property of the United States.

4th. That he shall be allowed to use his pony for hunting or pleasure under the supervision of his officers; but that the horse equipments shall be kept in the company armory and issued only when authorized to be mounted.

5th. That the ponies shall be subjected to semi-annual inspection, all found unserviceable to be replaced by serviceable ones. By such a system, which I think will be gladly accepted by the Indians, the Government would at all times have available a mount of trained ponies sufficient to mount more than double the number of Indians in the service (for they each own two or more ponies, and under the supervision of an officer this number will be greatly increased), besides removing forever the element which now retards the enlistment of horse Indians, not only with the infantry, but the cavalry. An Indian wants his horse for use and display, and the restrictions necessarily thrown around a horse furnished by the Government are such that it can never satisfy his wants, as he receives nothing to compensate him for the disagreeable duties incident to its care. The Indian pony requires no care, a corral with an open shed and running water sufficing for its protection in winter, while in summer it requires neither prepared food nor shelter.

By this system the Government will have available at all times a corps of mounted riflemen, corresponding to the Cossacks of Russia, who will always be ready to take the field at an hour's notice. In a country where there is either game or cattle they need no transportation except sufficient pack mules to carry their ammunition. They are men to whom mountains and rivers are no obstacles as they are trained from their childhood in all athletic exercises, and the youngest Indian in the service would be more than equal in woodcraft and self-reliance to the most experienced white soldier.

Great care should be observed not to repress or eradicate the training or habits of the barbarian, for the nearer he is brought to the condition of the soldier of civilization, except in the line of food, clothing and shelter, just to that degree will his efficiency as a soldier and scout be impaired, and he will bear the same relation to the white soldier as the beggars seen along the transcontinental railroads bear to our citizens.

From the earliest times the young warriors have been subjected to the most severe physical training in preparing them for the duty of defending their homes and country against the raids of hostile neighbors, and they still take great pride in athletic exercises and horsemanship. It should be the duty of officers commanding Indian com-

panies to encourage and foster this pride, and it cannot be done if they are deprived of their ponies, for a plains Indian on foot is out of his element. He walks awkwardly, for his limbs are distorted by riding from his earliest childhood, and he becomes an object of derision to his relatives and associates; but on his horse he is in his element, his face changes and he is a man proud and brave.

I would not keep Indian companies stationed near the cities or in the agricultural States, but in the vicinity of the Rocky Mountains and unsettled regions, and in summer and fall keep them in camp assimilating their normal condition where not incompatible with their thorough instruction as scouts and soldiers.

I am of the opinion that the companies now authorized can be filled up in this manner if experienced officers are assigned to their duty, and that the whole Indian race will be improved and elevated. They will be contented and happy while in the service and I believe will re-enlist if necessary. But if they are to be forced at once to abandon entirely their old habits and customs,—are kept tied up in garrison, subject to the monotonous grind of company and squad drill which drives even white men from the service, placed under officers who have had no experience with or sympathy for them,—can anything but failure be expected? I have in my experience always found Indians to be faithful, loyal and obedient, more amenable to discipline than any people I have ever commanded, patient and uncomplaining under privation and hardship, considerate and unselfish in their intercourse with each other, and while I have lived and camped with them for months at a time I have yet to hear of a personal quarrel or controversy among them.

I should deem it a great misfortune both for the Government and the Indian if the efforts of the Honorable Secretary of War and the Major-General commanding the Army should prove to be a failure merely through a matter of detail. No matter how broad are made the lines under which we receive them, they can be modified if necessary as the Indians become more civilized and accustomed to the service.

Our regulations should be modified to meet the necessities and wants of the Indians so that officers may be protected in using their own discretion to meet emergencies that do not arise with white troops.

Lieut. Powhatan H. Clarke, 9th U. S. Cavalry.

In a very interesting article in the *JOURNAL OF THE MILITARY SERVICE INSTITUTION* for November, Lieutenant Penn makes a plea for the creation of Mounted Infantry in our regular army. Unfortunately he shows himself thoroughly unacquainted with the spirit that exists among the officers of our cavalry, and much of the advice he gives them in good faith in his closing remarks is thoroughly gratuitous.

More than ever since the introduction of long range repeating carbines, such as we hope soon to get, does our cavalry feel competent to cope on foot with infantry. The fact that Hamley knew cavalry that was not able to seize posts and defiles, has nothing to do with American past or future. What the author does not prove is the necessity for having any body of mounted men in such a condition that they cannot fight from their horses, hence cannot furnish patrols competent to collect information. Such bodies are at the mercy of any bold, active enemy who charges them before they can get their firing lines ready to repel a charge.

I know of no other country that in a short space of time could turn out the thousands of horsemen that we could gather from our South and West. It may be necessary to have some of them capable of only half the duty of mounted troops, but I doubt it; for with this class of men the use of weapons comes naturally, and for the sabre the necessary proficiency is not so great as fencing masters would have us believe. In case it should be necessary, this class of men would not have

much to learn from such mounted infantry as the author suggests. Half the cavalry drill regulations would suffice. "Nicety" (I suppose this means accuracy) of movement, as far as it is attainable without interfering with instruction with weapons and field duty, must remain the great object not only of cavalry officers at mounted drill, but also of infantry officers at dismounted drill who expect to command even the smallest units in the great armies that the United States would have in war.

"Nicety" (accuracy), combined with simplicity, makes quick movements of large armies possible. Drilling of units with the object of attaining perfection may be carried so far as to interfere with other important duties. No one can expect to attain the perfection in our National Guard, nor volunteers for war, that is attained in Europe. Still, in a small regular army that is supposed to be the model, and that has incomparably the best method for obtaining its officers, there is no reason why this nicety and perfection should not be the aim. No one need fear that the Americans will not be loose and airy enough in their tactics when war does come. I have yet to see the individual, the platoon, company, or regiment, that has suffered from nicety of movement, mounted or on foot. I, for one cavalryman, do not mind being called an infantryman, mounted infantryman, dragoon or lancer, nor do I care if the gun I have is called rifle, howitzer or carbine, provided it is not too long and heavy; but as an American, I do not want to feel that the mounted troops I am with cannot do anything that any other mounted troops do or have done, from the example quoted at Chattanooga to the charges at Custozza and Mars-la-Tour.

I say let us have a model infantry on foot, "with personnel radically changed," the officers "young, trim-built, athletic" men, "fond of all out-door sports," especially walking: then let us have a cavalry on about the same general principles, except that the young men shall also be fond of riding; all pretty much imbued with the wholesome American ideas, instilled into them at West Point,—and the country's integrity will be safe.

III.

"Battle Tactics."

Lieut. A. S. Frost, 25th Infantry.

CAPTAIN EDMUNDS' proposition under this head seems to be the logical outcome of the system of rifle training followed in our army.

For example,—our men who are superior shots are practised at long range firing, which is quite correct; and it has been noticed that the shooting of the average shot deteriorates much more rapidly as the range increases than that of the good shot.

Therefore, it is proposed to divide the men of a company into four lines, the first, composed of the best shots, to lead the way, the next best shots to constitute the first reinforcement, the third class to make the second reinforcement, and the scrubs to furnish the momentum and moral energy necessary to carry the line forward to the final onslaught. Thus, as the captain observes, "the men of the company join the firing-line at a time when the efficiency of their fire can be best utilized."

This reasoning will doubtless be favorably received by all those who believe in the utility of independent fire in battle; and, indeed, viewed from the standpoint of the rifle range, it is quite natural and plausible.

But unfortunately, battle-fields differ from rifle ranges in several important points. The enemy is not eager to mark the result of our shots, nor do we know the range, and even the best shot finds that he has nerves when he hears the enemy's bullets, no matter how much he may have derided that notion in peaceful practice.

Now we are told that the object of the firing-line is to draw the enemy's fire and keep him occupied, in order to discover his position and afford protection to the troops in rear.

Would not the scrub shots answer this purpose? The objection may be made that the long range fire of the scrubs would not shake the enemy; but is it not as likely to do so as that of the best shots? I answer unhesitatingly yes; because I do not believe that long range fire ever shakes the enemy, no matter what the quality of the troops using it may be.

If then the fire of the scrubs will answer as well for the purposes intended, would it not be policy to put them in the firing-line? This would save the best men (or marksmen) until later in the day.

But there is another reason for reversing the order suggested by Captain Edmunds and this is a purely moral one. Here it is for what it is worth:—

Our men are already graded by the system of classification and decoration now in vogue, and the man of a lower classification is indirectly made to feel confidence in and respect for the man in a higher one, while the latter very naturally has little or no confidence in the poor shot. Therefore when the moral energy of the firing line is exhausted and the men look back for reinforcements, will the advent of men officially classified as scrubs have a tendency to impart an onward impulse or such a one as will carry the enemy's position? It may well be doubted.

On the other hand with the order of the lines reversed, the confidence of the firing-line will be intensified with each accession of strength. The soldier will say: "If the scrubs can do this much, what will we not do when the sharpshooters come up?"

The physical reason the captain gives for the order of the lines is a very good one if we can conceive of a field of battle being similar to a rifle-range, but unfortunately amid the terrors of battle the fire of one individual is not likely to be greatly superior to that of another, no matter what their respective peace qualifications may have been.

But even allowing the captain the full benefit of his assertion, we know that moral force predominates in war, ergo, the order of the lines should be reversed.

In his *Company Battle Tactics* the captain relieves the soldier of all restraint at the outset; and, regardless of the idea now rapidly gaining ground that in dispersed order control is more necessary than ever, he launches boldly forth into untrammelled individualism.

"Fire is opened by the first line without command. It is left to the discretion of the men when a shot can be made effective."

If all men were infallible judges of this point, nothing could be said against the adoption of such a rule, for as all would agree we would have concentration of fire, and it would necessarily be directed upon the vital points of the enemy; I may add that officers would be quite unnecessary, a few cooks and clerks for mere matters of administration would suffice. But alas! men do not agree even in this matter of selecting the objective, and, it being just as necessary for men to act together now as it was in Frederick's time, it is very probable that our men will be forced to submit to the tyrannous sway of the commissioned officer for some time to come.

It is quite as reasonable to assume that all men are heroes as to assume that all are judges of the tactical exigencies of the battle-field, and a system of tactics founded upon this latter assumption is certain to end in disaster.

There can be no doubt that in the future infantry will fight in dispersed order, a formation unfavorable to control, and any system of training adopted should lay down at the outset that men should never fire until ordered, and that the officer should

be the sole judge of the kind of fire, the objectives, elevation, etc., for if each man is allowed to follow his own bent the army will soon become a mob.

In view of the fact that in the event of war our country depends upon hastily organized and untrained volunteers, any tactical system adopted by us should be suited to such a force. Napoleon found that with such troops control was all important, and may it not be so with us?

Captain Edmunds' deductions from our system of rifle training serve to emphasize the fact that in military instruction we should seek to avoid all that is misleading.

The proposed "Battle Tactics" are deserving of especial attention as an effort in the direction of simplicity—"a consummation devoutly to be wished."

Reprints and Translations.*

SMOKELESS POWDER.

Précis from the French of CAPTAIN G. MOCH,† French Artillery.

By CAPTAIN F. A. MAHAN, CORPS OF ENGINEERS, U. S. A.

CAPTAIN MOCH contributes to the *Revue d'Artillerie* an interesting paper on smokeless powder in which, after considering similar articles which have appeared in various military and other journals, he gives his opinion of the new explosive as follows: "Hence we shall understand by smokeless powder one which produces a very light cloud, not of smoke, but of bluish vapor, which, disappearing almost immediately, is not sufficient to indicate the position of the infantry. This vapor only betrays the place of a cannon in so fleeting a way as to give no chance for accurate aim, even at short range, and in no case can it interfere with the fire of the piece itself or with that of those alongside."

While the claim is made by some that this powder is noiseless as well as smokeless, it is found that such a claim is not supported by the facts. The sound, to be sure, is greatly reduced. The crack of a rifle becomes inaudible when the listener is standing still at a distance of 200 to 300 metres, unless atmospheric conditions be favorable, when the sound-range may be increased to 400 metres. The boom of a cannon becomes "short, sharp and much weakened."

Captain Moch divides his article into three parts: Field, Siege and Naval warfare.

Under the first head he includes explorations and outpost service; general ideas about combats between small units; infantry against infantry; the artillery struggle; artillery against infantry; cavalry; partisan warfare; the higher command.

In reconnaissances the advantage lies with the side which first discovers the enemy. It is known that the enemy is to be found in a certain direction and his force and position are to be determined as best may be. If he be discovered in the march he may be surprised, or fire may be reserved until he reaches a dangerous point. If he be at a halt the prudent limit of advance may be determined.

In general terms, if both forces be not on the march, the advantage lies

* Please address communications concerning reprints, translations, reviews and exchanges to Lieut. J. C. Buss, editor of this department.

† *Revue d'Artillerie* for January, February and March, 1890.

with the one which is stationary. But on whichever side this advantage has heretofore been, it was lost at the firing of the first shot. Hereafter it may be retained much longer.

Take, for example, the case of an ordinary infantry and cavalry reconnaissance meeting an enemy armed with the old powder. At the first shot warning is given of the enemy's direction, and if it were fired within good musket range the smoke would certainly have been seen. Whether the fire be returned, or the enemy retreat, he knows where the danger lies. With the smokeless powder, on the other hand, there can be no telling whence comes the shot; nothing is seen, nothing heard. Besides, the greater range given by this powder lessens the chances of either hearing or seeing, since the crack of a rifle at 600 metres is inaudible.

Hence, reconnaissances will become more difficult and dangerous than now. As a general rule the enemy will be kept farther away, and his chances for gaining information will be much lessened. It will therefore be necessary to select men of especially good and clear sight for such duty, and they must be carefully trained in it.

As the time of service of enlisted men is comparatively short, it may not be possible to educate them for this work which will therefore devolve more and more upon the officers.

The proportion of cavalry may have to be increased in order to keep up connection between coöperating units such as several columns moving on parallel roads. Patrols and small intermediate detachments must be multiplied.

If, as has been seen, reconnaissance duty becomes more difficult, will that of the outpost be less so? By no means. The sentinel, to be sure, has many advantages in his favor *provided that he see the enemy first*. But the enemy sometimes has the first shot and the sentinel is killed, and with the new powder no alarm is raised. The assailant has less fear of arousing the supports, who may not even hear the report of their own sentinel's piece. The supports may be overpowered without the reserves being aware of an attack. The smokeless powder, therefore, will demand still greater watchfulness, and some means of giving an alarm must be adopted.

One method suggested is to have blank cartridges of ordinary powder for signals; but this will cause confusion. A second is to have two sentinels, one to shoot and one to signal. A third and better method is to have the chief of the "point" or picket provided with signal cartridges to be used in emergency.

If the signal cartridges are not sufficient, there is nothing to do but to set the outposts closer together. The grand guards cannot be placed nearer to the line of sentinels because they must have time to form to meet an attack. It may, therefore, become necessary to form an intermediate body. But this will greatly increase the number of men on such duty which will become, therefore, much more burdensome.

Perhaps men of the signal corps may be used to send messages back. Dogs may also be trained to carry messages as well as to watch with the sentinels.

To sum up: let us suppose that two hostile forces are both provided

with the smokeless powder and that one of them attempts a surprise. As he will not attempt it without having carefully reconnoitred the enemy's position, and as he is free to choose the time and direction of his attack, he will be, *a priori*, in a better situation to see without being seen, and thus to obtain the greatest advantage from the possession of an ammunition which will assure him the secrecy which he needs. More than this, the relative silence of the muskets places the odds in his favor for the reason that the support and grand guards will not be aroused in time. From this point of view the surprise of isolated posts and localities may be facilitated.

"On the other hand, if the assailant risks an unprepared attack, or does not succeed in eluding the watchfulness of the sentinels, he may fail under conditions most dangerous for himself, as he will be surprised in the very midst of his march by unseen foes. If, then, the defense has made effective dispositions to secure timely warning of any attack, it may gain greatly by the possession of the new powder. As a matter of fact its troops will be able to rest much better, being no longer disturbed every moment by shots at the outposts, oftentimes unnecessary."

GENERAL IDEAS ABOUT COMBATS OF SMALL UNITS.

Effects of smoke.—The experience of the grand manœuvres of the European armies is that, with the enormous number of men in action armed with repeating rifles—and with the increased amount of artillery and the general use of machine-guns—the smoke becomes so great as to prevent either side from seeing the other. Doing away with the smoke permits each side to see equally well, in which lie an advantage and a disadvantage.

The advantage is inestimable. The effectiveness of fire depends on many causes, some inherent with the soldier, some with the orders received from his chief, both kinds being favorably influenced by the suppression of smoke.

The disadvantage does not always exist. Absence of smoke favors the firing line, as its position is not betrayed. The same may be said of a battery under cover. On the other hand the infantry, on the skirmish line, cavalry watching for a chance to charge, artillery not in action, all these need smoke to screen them.

But, be the difficulties in this respect what they may, the rule of the French artillery, "Above all to *see*, and, if possible, not to be seen," and that of the German service, "All thought of cover must yield to effective fire," hold good at all times.

Morale of the troops.—Before considering the combat of each arm, the general effect of smokeless powder on the troops may first be considered. Much stress has been laid on the effect on men of seeing a comrade stricken down without hearing the fatal shot. Those who hold to such ideas forget that in ancient times all projectiles were thrown without any explosive noise, and that, although a single shot with the new explosive may not be heard 200 metres off, there is still much noise along the skirmish line or near a battery in action, not to speak of that caused by the whistling of bullets and the bursting of shells.

Undoubtedly there are croakers who see evil in this as in all improvement and advance, and it is still an open question whether the greater confidence gained by seeing what they do and whither they go will not fully make up to the men what they lose by being more exposed and by seeing more of the horrors of battle.

INFANTRY AGAINST INFANTRY.

Fire.—Infantry fire, much more than that of artillery, depends upon the individual coolness of the men, on whom, as well as on their immediate chiefs, the new powder will act advantageously.

Up to the present time the soldier began firing at the puffs of smoke made by the enemy, often at distances beyond accurate aim. As the distance between the two lines lessened the objective disappeared in the smoke. In the future, firing will not begin until the enemy is seen, that is the individual men. The smoke, especially of his own piece, not being in the way, a man will not be led to fire at random, but will aim deliberately at an object, and the result obtained in action will not be so radically different from those obtained at target practice.

The commander of a small unit will have his duties made easier by being better able to overlook his men and to see at a glance what they are doing and his voice will be more readily heard by reason of the less noise.

He will no longer find it difficult to follow, as far as necessary, the general progress of the fight because, being able to see the units alongside of him, he can conform his movement to theirs. If he fall, the next in command knows at once that he must replace his chief.

Attack.—To fire is not all that the infantry has to do. It is not a question of standing fast, and firing. Ground must be gained if a victory is to be gained, and here is where the reverse side of the matter appears.

While firing the infantry is glad to have no smoke. But when the advance commences, however little the distance may be, they will then be received by a fire of which nearly every shot will tell. Genuine courage will be needed to advance. This may be sustained by the thought that to run will be sure death, and everything possible should be done to impress this on the men. But how much of this teaching will remain when once under fire?

Moreover the supports will meet with greater or less loss as they are more or less massed. To bring troops up from the rear of the battle-field to the skirmish line will be a difficult undertaking, and he will be a skilful manœuvrer indeed who does not lose the greater part of his men in accomplishing it.

"Two conclusions may be drawn from the above: The supports and reserves of the attack should be deployed early, so as to become as it were a second and third skirmish line. The defense should keep grouped a certain number of small units whose express mission will be to fire by volley on the reserves of the attack."

THE ARTILLERY STRUGGLE.

Effects of smoke.—In the artillery combat smoke plays a most important part by reason of the heavy cloud made by this arm; its methods of firing;

the considerable length of time which it spends on one spot, and, above all, its having no other mode of action than firing.

Smoke acts passively by interfering with aiming, by preventing the points where the shells strike from being seen, and by making it impossible to hide the position of the batteries. It acts actively by performing these same functions for the enemy. The advantages and disadvantages are equal in number. But it will be seen that it is possible to add to the former, while the latter are inherent to smoke and can only disappear with it.

At the first glance some minds may have thought that artillery would gain less than infantry by the suppression of smoke. On the one hand it can use lateral observation to regulate its fire, and it has various methods of preserving range and direction after they are once determined. On the other hand artillery is hard to keep out of sight and is therefore benefitted by whatever contributes to this result.

All methods of aiming in the midst of smoke are but makeshifts. Nothing can replace a clear view of the field.

Positions of batteries.—There remains the question of protection by smoke which is inseparably bound to that of the positions to be chosen.

The smoke curtain is of the greatest benefit in preventing the enemy from seeing where his shots strike.

There are even many cases where smokeless powder will permit better cover to be had than in the past. Not having always to expect smoke from the windward, a very favorable position may be taken to leeward.

The direct observation of the captain is undoubtedly the best. But at times he may need help. Specially selected men of very keen sight must be trained for this duty. They should occupy as high points as possible in action.

Furthermore is it quite true that we count so much on the enemy's smoke to show where his guns are? To be sure with black powder that is all we see, as a rule. The flash sometimes shows. It will do so more in the future than in the past. The cannoneers will be seen as they move—objects in motion attract attention. The only position in which absolutely nothing will be seen is in the case of a wood. But as nothing could be seen formerly nothing is lost now.

Pointing.—Gunnery can no longer be told to aim at the smoke. The gunner, according to Lieutenant-Colonel Pigouche, "is a machine for setting three points in a straight line." The enemy's smoke is far from being a point, so that we need no longer regret that it cannot be used as a mark.

Coming into battery.—The new appearance of the field of battle cannot fail to excite a great influence on the occupation of artillery positions. Coming into battery should be absolutely concealed from the enemy. It would be well to unlimber out of sight and to run the pieces into battery by hand. If we are to obtain the best results from "the substitution of a stealthy chemical agent for a noisy explosive" we must come up as stealthily as we fire. This will not always be easy. But consider the effect produced by a battery springing as it were from the ground and bringing an effective fire at once on points known beforehand.

Successive positions.—Hence there will be no more coming into battery in sight of the enemy. How then can we change position?

It may be accepted as a principle that fire will certainly open at very long range. Prince Hohenlohe remarks that he has never seen firing begin except at a distance far greater than that prescribed by regulations. This distance has been constantly on the increase and is now, as a rule, 2500 metres. As smoke no longer interferes, the side which first sees the enemy will surprise him with projectiles and will gain the preponderance of fire; since the enemy, even with his pieces in battery, will lose time in trying to discover the source of attack. By moving forward we run the risk of being seen before firing and thus lose the initiative. Under these conditions how can the temptation to begin firing, even at 4000 metres range or more, be resisted?

To be sure aiming at such long ranges is difficult, but it is not claimed that firing should always or is likely to begin at such distances. What is meant is that firing will begin so soon as the enemy is seen.

It is to be expected that the artillery of the advanced guard will open fire at greater distances than is possible with black powder. This it will do in accordance with instructions to so choose its positions "as not to become involved, in spite of itself, in a short-range struggle with a greater number of hostile batteries."

While these distances may do for reconnaissance they are not suitable for battle. The main body of the artillery should come as close to the enemy as it can. But this will often be difficult. At this time the enemy's artillery is intact. All the batteries do not come into line at once, so that if those first on the line are seen, the probable position of the others can be determined. In this case smokeless powder obliges us to come into battery out of sight or to be in sight as short a time as possible, but the nearer the lines the harder this is to do.

This prudence will cause a considerable time to be devoted to getting the main body into battery. But this time is not lost. The delay caused does not hazard the safety of the batteries as they are supposed to be masked. And it will be largely made up in the total length of the fight by the better conditions under which the artillery struggle will open. On the other hand we must move over the exposed portion of the ground more rapidly even than we do now. Except on a very broken field a change of position can only be made if the opposing artillery is much injured. Now, if from their first position our batteries have done the enemy so much harm, would it not be better to keep up the fire there, giving him no rest, rather than to run the risk of changing a half success into a complete check?

It seems then that it should no longer be considered a rule to push the batteries forward to end the artillery struggle. The benefits are much less and the risks much greater than in the days of black powder. But we have no intention of dignifying this as a principle. Tactics has recently been defined "as the art of coming to a decision in any particular case." In other words circumstances are above all rule. It may be necessary to move the artillery forward, but this will, we believe, only happen in exceptional cases when

some great advantage is to result from it, and the movement can be made under cover.

The artillery struggle being finished, the infantry attack must be prepared and supported. With the present guns 2500 metres is a good range at which to prepare it, but the great question is how to support it. Many think that the artillery should push forward to 600 or 800 metres from the enemy's lines, the reason being that if it remain behind, the infantry may lose confidence. On the other hand the present infantry rifle is very effective at 1200 to 1500 metres range, and volleys at these or shorter ranges might cause such a destruction of the artillery before the very eyes of the infantry as to bring on a panic in the ranks.

Only a small part of the artillery should be sent forward, while the rest should redouble its fire as the best way of supporting the attack. A shower of shells on the point to be carried will do more good—setting aside the physical effect, and speaking only of the moral—than the sight of several batteries uselessly sacrificed. The main use of the batteries sent forward is to occupy quickly the enemy's position if taken—this failing, to sacrifice themselves in order to diminish the effect of the repulse.

To sum up: "We believe that it will happen that batteries will open fire at much greater range than that allowed to-day. At whatever distance we may do this our endeavor will be as in the past to take post at 2500 metres from the enemy for the artillery struggle; but this will not always be possible. As a rule it will be useless to go nearer, either to end the artillery duel, or to prepare the infantry attack. As to the batteries pushed forward when the attack begins they can hardly be brought nearer than 1200 to 1500 metres from the enemy's position."

Conclusion.—"After all said and done we hope that we have shown that the artillery will be far from regretting the loss of the two clouds which hung, the one in front of our own, the other in front of the enemy's guns. The benefit does not seem to us doubtful even as regards the second, a subject which has been much discussed. After all, smoke is a cover added to that furnished by the ground, and no one has ever been anxious for his opponent to have covers which he could turn to advantage. If both are deprived of this cover victory will belong to him who, all else being equal, can most skilfully supply the deficiency."

The "*Militär Wochenblatt*" says: "Artillery officers feel themselves relieved from a real oppression. For years they have racked their brains for some means of overcoming the disadvantages of the smoke made by the masses of artillery; the question had even been made the subject of competitive essays without anything save insufficient make-shifts having been found. Whereas formerly the artillery fought with its eyes blindfolded it will never for an instant hereafter lose sight of its mark. Only now are we able to apply sound tactics to the artillery which will be affected only by the condition of the fight and the field, and no longer by the direction of the wind."

To sum up: the new powder places the artillery thus:

"(a) *Fire.*—The reciprocal visibility of the two lines will depend hereafter only on the ground and on the skill with which it is utilized.

"Direct aim will always be possible and will even be assisted by the condition of using only reference points; as these are certain not to disappear.

"The observation of the points of fall, and consequently the range, are assisted, provided that the attention be less given to the target itself than to a reference point carefully selected beforehand in its immediate neighborhood, which we are sure of always seeing.

"(b) *Positions*.—In no case should a battery be left uncovered. The difficulties found in this regard are compensated for by not having to consider the direction of the wind in the choice of position, and by placing batteries at different elevations or distances on advantageous or specially important points.

"(c) *Coming into battery*.—Coming into battery by hand will hereafter always be the rule. The ordinary way will only do for exceptional positions or for cases of great urgency, as when a battery is surprised on the march by the enemy's fire, or during a pursuit.

"(d) *Successive positions*.—The desire to obtain the advantage of the first gun and of the first range will very likely lead to opening fire at a very great distance.

"Changes of position will be almost wholly limited to those which can be made under cover. In any event it is not at all likely that batteries will be placed so near the enemy as is allowable at present. The divisional artillery will accompany the attacking infantry with its fire, and not with its guns.

"(e) *Effects and influence*.—Whichever of the artilleries gains the advantage in the duel will be absolute master of the field of battle. No movements of troops of any importance can be made without discovery at less than $2\frac{1}{2}$ miles distance, and large movements are not easily concealed.

"The speed with which the main body of artillery will come up to sustain that of the advanced guard will hasten the beginning of the artillery duel. This may be long, and the probabilities are, as a rule, that it will be so; but circumstances favorable to one of the two parties, added to a thorough knowledge of fire, may also greatly shorten it. To obtain the range first, even if imperfectly, will be of prime importance. The artillery which gets it will have an enormous superiority and will soon be able to release some of its guns to use against the more distant columns of infantry. It cannot be doubted that when the artillery duel shall thus have been rapidly brought on, its issue will be decisive; and that the side whose batteries have been destroyed, must expect to be dispersed by cannon shots while deploying.

"In case of retreat we can scarcely count on the possibility of having supporting positions occupied by the batteries withdrawn from the line. On the other hand a few batteries, previously placed in commanding positions to the rear, may obtain great results by unexpectedly opening fire on the enemy who cannot fail to uncover himself when coming to occupy the position when pursuing its defenders.

"As to the pursuing artillery, setting aside surprises of this nature, it will have a fine opportunity for making a retreat in good order impossible; bursting projectiles, accuracy and efficacy of fire within the limits of sight,

in a word smokeless powder, are well adapted to change a retreat into a complete rout.

"We see what a task may fall to the artillery. It may often decide the day; and, as a rule, it will leave little to be done because its power is now so great that the infantry cannot be moved to the attack without preparations so complete that the enemy's position is carried in advance.

"But such a power is not without its drawbacks. In the first place one or the other artillery must be absolutely destroyed. Superiority of aim once acquired will spread to the adjoining batteries like a drop of oil on water. One objective being destroyed, the fire will be turned against those with which the other groups are struggling.

"Under these circumstances to what strain must not the personnel be equal! Absolute coolness,—perfect composure in the midst of bloody losses,—prompt decision in command,—sure, clear eye,—all the greatest qualities of the commander of troops, are indispensable for the captain of a battery. It will be answered perhaps that they are necessary for every officer; true, but it will be required of the artillery in the next war that the commanders of batteries shall always display them all, if they wish to be equal to their task."

ARTILLERY AGAINST INFANTRY.

As has been stated already, the artillery will open the action at a great distance if it then sees any object worthy of its fire. Infantry in column presents an excellent target for which a choice of projectiles is easily made, because the first shell which bursts at a suitable distance from a battalion will inflict terrible damage. So soon as any reliable method of determining ranges on the field is had, the surprising of infantry with shell at long distance will have a most potent influence.

But at close quarters the situation changes quickly. A few good rifle shots have heretofore been able to worry a battery greatly. Now, by reason of the increased range and accuracy of the new musket, a few men coming up to within 800 metres range can do untold harm, because, as they are unseen, no one can tell whence come the shots. In each body of infantry there should be men trained for this duty.

(To be continued.)

LETTERS ON INFANTRY.

BY PRINCE KRAFT ZU HOHENLOHE-INGELFINGEN.

Translated by LIEUT. ODOU GUROVITS, 11th U. S. Infantry.

XIII.

THE INFANTRY REGIMENT.

IN my last letter I commented upon every possible phase of the infantry combat with reference to the battalion.* However, this is excusable, as the battalion still forms the tactical unit in battle, and we always count troops by battalions. On account of the importance of every individual soldier in a fire combat, as well as the necessity for detailed supervision and control over each man, the company often assumes the rôle of the tactical unit. But the company alone never can carry through any engagement of importance. To achieve success will always require the coöperation of several companies.

Therefore, in illustrating my principles of infantry tactics, I have dwelt mainly upon the rôle of the battalion, and thus but little remains to tell you regarding the next story of the military edifice—the regiment.

The regulations appear to regard the commanders of regiments, when the battalions are united into regiments, as superfluous. For after speaking of the battalion in the 3d and 4th chapter, the regulations at once pass on to the brigade.

It is needless to call your attention to the important part which the regimental commander plays. If we consider the amount of his duty we become aware of the gap which his loss would occasion. He has to superintend the entire training of his regiment in detail and is responsible for it. He has to look after the supply of officers and see to their training for duty as well as their education and moral character. He controls and supervises the appointment of non-commissioned officers to all the twelve companies, and no one year volunteer can be accepted by any company unless the colonel has first seen him and approved of him. He directs the selection of the tactical principles to be carried out at drill, and is responsible for it as well as for the tactical instruction. Furthermore he inspects the money accounts and clothing and has charge of everything relating to barracks and quarters and subsistence of the men, besides the important duties connected with punishments and minor jurisdiction. It is true that the same thing applies to every other branch of the service, but the number of men is far larger in the infantry regiment and thus the amount of work is much greater.

There is a great difference between taking care of each individual among 700 and of each one among 1800 or 1900. The demands upon the energy and zeal of a colonel are such that we may well doubt whether the nerves

* It must be remembered that the Prussian infantry regiment consists of three battalions.

of any individual can stand the strain. I need not mention all this to you. I well remember the time when you held that very same position, and opened your heart to me. Do you remember describing to me one of your days and that one on which you proposed to take some rest? The doctor had ordered you, as you had a chill, to remain in bed longer that morning to await the result of a sudorific. You had selected the day before company inspections in order to be entirely well for that task. Some important office work, which could not wait longer, you had intended working off on that day of rest. The paymaster was to appear at 10 o'clock with a lot of administrative questions and the pay-committee was to assemble at 11, for it was pay day; after that the provost officer had to be seen on account of an unusual number of cases which required investigation. At 7 o'clock A. M., when you lay perspiring freely, you received news of a serious case of breach of discipline, which had taken place in barracks, which could not be properly settled without the immediate personal presence of the regimental commander. After dressing quickly you proceeded to the place in that inhospitable spring weather—hail, rain and sunshine alternating at short intervals. The perspiration was checked and you shivered instead. It took several hours before the matter was disposed of, then you hurried home. The paymaster was waiting. Hurried as you were, you could only dispose of the more pressing matters and then attend the committee; after which you had to see the provost officer. There were some complicated cases which you found it difficult to decide immediately, and you concluded to read over the papers connected with them, alone and undisturbed, and to compare the opinions and reports of the provost officer with the regulations and orders as to punishments. Between 1 and 2 o'clock you dismissed the provost and gave orders that no one was to disturb you any more that day.

Clad in a comfortable dressing gown and stretched out on a sofa before the fire, you had just picked up the first paper presented by the provost when the adjutant insisted upon seeing you on account of a report which admitted of no delay. This was indeed the fact! An officer had shot himself under peculiar circumstances and your presence at the scene was most necessary. You could have ordered the next in rank to report for instructions and to investigate the occurrence—you might have done the same in the morning. But one who has only a small sense of military duty, does not like to shirk responsibility in such important matters. You were not reported on the sick list, you had not handed over the command of the regiment, therefore you were right in attending to the matter personally. Of course, you were again exposed to variable temperature and on business of a most distressing nature. I happened to meet you on the way and witnessed the scenes which took place—the investigation by the legal authorities, the despair of the suicide's wife, and the incoherent speech which the old father addressed to his son's corpse.

After giving the necessary directions you returned home. It was late in the afternoon before you could resume your interrupted work and night fell before it was completed. Some important correspondence relating to the admission of candidates for lieutenancies in the regiment, which could

only be answered by yourself, had to be postponed until next day. This, then, was your day of rest! If the saying "There is no rest but in the grave" applies to any one, it does so especially to the commander of a regiment. It was no wonder that you were ill after this of a serious cold. Some think that the regimental commander has power to lighten his work, that he has his adjutant and clerks, and can besides employ other officers. Only those who have never commanded regiments can imagine that the colonel need therefore never write himself. Everything pertaining to the selection of candidates and reports on officers, matters requiring the greatest delicacy and tact, and which must be buried in the breast of the regimental commander, since no one else must know of them, he is obliged to write himself. You once mentioned to me, did you not? that during the time you commanded a regiment you selected 60 candidates and rejected 240. I know from experience to what dimensions the correspondence in any one case may grow, and I know how carefully such letters must be worded in order not to be misunderstood or give offense, especially if the candidate is rejected. However, you did not fare so badly as I did in similar cases while commanding the regiment of field artillery of the Guard. The father or guardian of some young fellow, whom I had been obliged to refuse as a candidate, never failed to complain of me, first to the brigade commander, then to the inspector, then to the inspector-general, and finally to the field-marshal himself. Although I was always fortunate enough to be sustained by my superiors, yet that did not lessen my correspondence in any way. The very importance of such matters makes them especially trying to the nerves.

A regimental commander at present must in addition to his regular military duty of working his command on correct tactical principles and of looking after the military, moral and technical training of his regiment, be a lawyer, in order to act correctly in administering military law, and an accountant in order to properly control the paymaster, unless he prefers a surprise some day and the most disagreeable of all investigations due to a shortage in the treasure-chest. He must also be something of a tailor and shoemaker in order to superintend the proper clothing of his men. And of all these, that of which he knows the least will give him the most trouble.

How much time is there left for recreation, or to work out interesting and instructive exercises for the officers, or to prepare himself for the field manoeuvres and enter into them with the necessary energy and confidence, and in addition to all this to attend to the social duties to the officers and their families and appear pleasant and sympathetic, sharing their pleasures or directing their conduct.

At the time I had the honor to command an artillery regiment it consisted, according to the then organization, of fifteen batteries and contained about as many men as our infantry regiments do now and a few more officers. The great amount of daily, important and pressing business was such that at night my head felt like an exhausted well which yields mud instead of water. I then understood why so few regimental commanders keep up their professional studies, especially if they were married, and desire, even

if free from care, to devote a few hours to their families in order to insure that they attain a proper position in the world. Only a few exceptionally bright minds are capable of keeping up with current events and advancing their own knowledge by reading military works and keeping in touch with the progress in the art of war.

If the regimental commander attends conscientiously to his duties we cannot expect him to keep up with general knowledge or enjoy the pleasures of art.

I have often thought whether it would not be better to lessen the work of the regimental commander by transferring it to the battalion commanders and thus do away with the former, or to be more explicit, to make regimental commanders out of the present battalion commanders, an acting field officer being added to the establishment. There would thus be no increase in the number of field officers, for we now have six with each regiment—the regimental commander, the three battalion commanders, an acting field officer, and the so-called thirteenth captain. The drill regulations hardly ever speak of the drill and fighting of a regiment, and this appears to smooth the way to such a reorganization. In case of war there would always be a field officer available to take charge of a landwehr battalion, a reserve battalion, or a battalion of newly raised troops.

But the more I have considered such a reorganization as that proposed above, the more I am convinced that it would do more harm than good. The then commander of a regiment having only four companies under his command would not have so much work as at present. This is true, but it would be the only advantage. Everything else tells against such a proposal. The body of officers would become too small to be effective in every way. We should but seldom find in it the various qualifications for the different staff and administrative duties for which selections must be made with care. Small personal differences might easily destroy the existing good fellowship among the officers, which is the foundation of the excellent *esprit de corps*. The scientific and social meetings which bring about earnest discourse and cheerful companionship, which unites the young officers and makes their lives pleasant, would then be lost and would give way to a general apathy. The young officers would grow accustomed to spend their evenings in beer houses, with the liability of falling into bad society, or worse still, to gambling. I am prepared for your remark regarding the Jäger and Pioneer battalions which have an independent body of officers. I am convinced that these very officers feel most disagreeably the small number of comrades in their regiment.

Important as these arguments are, they cannot form the decisive ones in the selection of a military organization. The main point is, and always must be the battle, which is the main object of armies. Let us look into military history and find out whether the regimental commander in modern battles is tactically necessary or not. In regard to the battle of St. Privat where, with one exception, all the regimental commanders were either killed or wounded, we may conclude from this fact at least that these officers displayed great activity during the struggle. If we examine the maps pertaining to the official account, we can form a general idea of the sphere

of work and influence of a regimental commander and the results. On these maps the positions of the different companies during the various stages of the fight are marked as the result of careful comparison of the various reports. There it appears, that after a regiment is once launched into the fight, a mixing up of different companies, even of different battalions, takes place, but at the end we find that the regiment has preserved its unity; thus proving that the fighting unit was the regiment and that the regimental command played an important and necessary part in the battle.

The most striking instance which I can recall, and which impressed itself forcibly upon my mind, was given at the battle of Vionville—Mars-la-Tour—where, up to the last stage even, this unit was preserved. At 5 P. M., after fighting with changing luck against superior numbers, we find (see the map) the greater part of the companies of the same regiment fighting shoulder to shoulder, and we can almost mark with a pin the point where the regimental commander must have stood directing the struggle and holding the companies together. Commencing at the left wing of the most advanced line of battle we first find the 38th Infantry Brigade retreating, overpowered by out-numbering forces; but these crushed fragments retired by regiments side by side. In the bushes of Tronville the two battalions of the 79th, which engaged in the fight, became so extended that for the moment a control by the regimental commander seems difficult and improbable. The 17th Regiment, therefore, entering the fight with all three battalions in close order, pushed itself in like a wedge between the companies of the 79th. We can see exactly how this regiment in close column furnished a support to the scattered companies of the other and upon which they could rally.

Northeast of Vionville we find eight companies of the 20th Regiment collected for a united resistance (the Second Battalion had been sent back with the 24th Regiment to Tronville in reserve), while next to the 20th Regiment and supporting it the 35th is engaged, and rests upon the 12th, which is in Flavigny, having left a few companies at Vionville. The 12th Regiment, however, fought in one line of battle, the three battalions side by side, with the fusilier battalion on the left flank, separated by sufficient space to prevent masking the long artillery line. Towards the right, further, the fight was carried on by half brigades fighting as a whole. All this speaks volumes for the necessity of a regimental commander.

Again at Gravelotte and St. Privat, even during the hottest part of the fight (see positions at 7 o'clock P. M.), almost all the regiments of that great army fought as such side by side in compact masses; at and around the farm of St. Hubert alone are there found crowded together 43 companies belonging to 8 different regiments. This appears to have been the only instance during that great decisive battle where the regimental unit was broken up and lost.

As far as I could observe the system of the Guard Corps in 1870-71—and being on the General Staff I had an opportunity of knowing every order and decision—it was to keep the regiments together as distinct units. Of course, necessity sometimes dictated detaching a battalion temporarily or sending the regiment into the fight with only two battalions. They even

preferred to break up a brigade than a regiment and form improvised brigades, as at the storming of Le Bourget, where the centre column was formed of the "Elizabeth" and "Augusta" regiments under the command of Count Kanitz, although these two regiments did not belong to the same brigade. Even at the start we saw several regiments taken from their regular brigades in order to form other brigades. Thus we find a Silesian regiment forming part of the IXth Corps, etc.

Although the drill regulations seemingly ignores the movements of a regiment and passes directly from battalion movements to those of a brigade, yet they only in appearance give the greater importance to the brigade and, equally in appearance only, pave the way for the abolition of the regimental command. I am almost tempted to assert that our new regulations lay more stress upon the importance of regimental commanders than our old regulations of 1847, since they attach great value to the employment of regiments by wings in the same line, a formation permitted before 1870.

So long as the two regiments of a brigade could be employed only in two lines, one behind the other, the importance of the regimental commander could be questioned. On account of the extension of front, which is a consequence of the development of the fire-fight, if the second line received orders to support the first, the unity of the former and its control by its regimental commander became doubtful, whereas if the regiments are formed side by side in wings, they remain united even when the second line or wing is pushed forward. In looking over the official maps we observe quickly where the regiments of a brigade were employed side by side or in two lines, one in rear of the other. The 38th Brigade fought by wings at the battle of Vionville as did also the 20th, 35th and 12th Regiments. The 17th Regiment, however, advanced in line in rear of the 79th and broke up the latter into two parts. You might justly ask—what of it?—since the object has been attained and the bushes of Tronville were in the end captured. It is true that on this occasion it did not seem to matter much, but we generally find that a regiment of three battalions fights better than three battalions of different regiments who happen to be formed together and become intermixed. Man is but human, and the natural desire for self-preservation often prevails. In such a case it is the fear of dishonor and shame which keeps the individual, so affected, in the fight, as he is among men whom he knows; while if he finds himself among men wearing a different uniform, and who belong to different regiments whom he knows not, the temptation to keep out of danger grows stronger in him. If we wish to gain an insight into the truth of things, we must take men as they are and not as they are made to appear by poetry and enthusiasm. There are heroes in every class of society and to the credit of manhood be it said—they are not scarce. I have witnessed many acts of heroism. The great mass, however, is not heroically inclined and have to be led up to deeds of heroism, and controlled when in danger.

Do not ask for proof of my assertions that a regiment of three battalions fights better than three battalions of different regiments. I prefer not to give you any examples, for to do so would be putting my foot into a hornet's nest, should I assert that at O the regiment A fought better than the three

battalions of the regiments X, Y, Z did at P. Of course I must admit that you are right, if you assert that the several separate companies of the 79th Regiment displayed the greatest heroism in the bushes of Tronville; the second company at the N. E. edge of the wood and the sixth at the E. edge, holding their positions, which were most exposed of all, to the end. Thus my own example proves the contrary of my assertion. Still I am right and if you differ from me, well, I cannot help it. These two companies inspire me with respect and admiration in proportion as they were farther removed from their comrades.

From what I have said, I have arrived at the conclusion that we should be thankful that our regiments consist of three battalions, and that we should be wrong to imitate the organization of those armies in which the idea of the regiment and battalion are synonymous. The disadvantage that the mental and bodily strength of perhaps half of the regimental commanders is so absorbed by their duty that they are ruined by it, and become unfit for further service, must be made the best of. These officers give, in time of peace, the sacrifice of themselves for King and Fatherland just as they would willingly give their lives for the same cause in battle. All the time that the colonels command regiments might well be considered a blank in their lives since they could then live only in and for their regiments. Their highest reward lies in the consciousness that they and their regiments were one, and the tears which a commander sheds on leaving his regiment afford the strongest proof that this time has been dear to him, in spite of all his labor; his unremitting care and all the wear and tear of his nerves.

To all the young officers, who complain continuously of their colonel's bad temper, impatience and harshness of language, I would like to tell about all the trials, criticisms and stings to which their commander is at all times daily and hourly subjected. I should like to advise them to be lenient in their judgment and charitable in their dealings with him, for a time will come when they will themselves know what it is to be the commander of a regiment.

With regard to the exercises and movements of a regiment contained in the 19th and 20th chapters of the regulations, I cannot well comment. They are founded on the experience of years, have been well thought out, are clearly expressed and apply not only to a brigade but to any body of infantry consisting of more than one battalion. In general I have found that these principles are well understood and practically worked out. The different forms and evolutions which apply to a regiment are so numerous that the idea of reaching perfection must be at once given up, because the limited time, eight days, devoted to them is so short that it becomes difficult to execute all the movements even once. Should the regimental commander insist that a certain movement be correctly executed, repeating it on account of previous failure, he runs the risk of finding his time running short and of having to omit some portion of the extensive scheme altogether, for the movements of infantry are slow and take up much time. It would thus appear desirable to increase the time allotted to regimental drills. But this cannot be done without curtailing others equally important. All the regimental commander can do, therefore, is to insist that the

elementary movements of battalion drill be thoroughly understood and properly carried out. Then there would be no time lost when the battalions assemble for regimental drill. This applies especially to the march past which the commander must order at least once in every possible formation, but of which he should avoid a too frequent repetition. If on account of improper execution he causes a march past to be repeated he may be sure that it will be even worse done the next time—to call attention to the fault and perhaps repeat the movement another day is the best he can do. For if he repeat it at once, the attention of those who committed the fault the first time will alone be alert, while all the others will be annoyed, and being in that frame of mind, will be more liable to commit errors. This is true of all other movements. The movements of a mass of infantry the size of a regiment, moreover, require so much time and are so wearisome that any repetitions on the same day must be annoying—and nothing renders drills so useless as needless annoyance.

Furthermore, the commander ought to practice only those movements which are of value in actual battle—excepting the march past. It is not always necessary to carry out the actual combat. The evolutions of a reserve, or of the 2d and 3d lines, are also battle movements. He must think out a situation suited to each movement and evolution, and inspire each soldier of his command with an appreciation of the conditions. If this be not done, the drill will prove useless. They cannot be made instructive if carried out perfunctorily.

I have met officers commanding infantry regiments, who, fully recognizing this principle, did nothing but manœuvre their regiments at drills.

They went too far in the other direction, because an infantry regiment cannot manœuvre independently without combination with the other arms. There is hardly time enough, during the limited period set aside for regimental drills, to execute every possible simple fighting formation even once only. A regimental commander must carefully prepare his plans the day before hand, if he desires to execute every manœuvre at least once during the time allowed. There have been cases—but thank God they are rare—where the commander of a regiment, thirsting for praise at the inspection, has performed the same movements day after day, and at the inspection produced this well practised, “show” performance, which, however, has in most cases turned out worse than any improvised manœuvres. Loss of time, added to most damaging consequences, are the result of such methods, and you will agree with me, I am sure, that such a commander is unfit for his position.

The greater the number of men on the drill ground, the more one feels the lack of reality, and the necessity of supposing many things and forces, especially the enemy, and thus much is left to the imagination. In order to avoid mistakes and misunderstandings, I always made it a point, at battalion and especially at regimental drills, to mark the supposed enemy's position by flags. If this were omitted, faults and confusion would result, because it is but seldom that the fancy of the regimental commander can be in complete harmony with that of his subordinates. These faults occur on the

drill ground, but in war they cannot occur for there we have a real enemy to deal with.

I am afraid that this time I have written you a terribly dull letter. It would render it more interesting and spicy, if I were to attack and blame all that is laid down and bring forward something new, although the latter might never prove of value. I cannot help it. I must praise what I consider right and good even though I run the risk of being dull. If I have been so, burn this letter, and imagine you have never received it.

"SERVICE RANGE-FINDING."

By LIEUTENANT BUCKLE, R. A.

(Lecture of Aldershot Military Society.)

IT is a well-known saying, "A man is made who knows how to use his opportunities." Do not these words apply equally to an army? The British Army has now very accurate long range weapons. We hear of the wonderfully effective fire of our guns when they have found the range; and of a marksman making several consecutive bulls-eyes at the running deer at 2000 yards on a measured range. But of what use will these long range accurate weapons be on service unless we are sure of our range on every occasion on which they are used? Here is the British Army's opportunity. We can be sure of all these ranges, we only require to learn how to use the range-finder.

Our army is a small one, we have not the large masses of troops to employ which the Continental powers possess, and consequently we must use every effort to increase the power of such few troops as we have, and this increase of power can be obtained by accurate range-finding.

Again, how often we hear the cry, "How are we to keep up our supply of ammunition in the field?" How can we do this more effectually than by making our fire more effective, certain, and under control? I would suggest that if there were not such a terrible waste of ammunition (which arises not so much from bad shooting as from shooting with an incorrect range) the difficulty of its supply would cease in a great measure.

And again, do not both infantry and artillery expend ammunition unnecessarily in finding the range by trial shots when the range can be ascertained with greater accuracy by the use of the range-finder.

As regards the infantry we read in the Infantry Drill Book of 1889: "It is of the first consequence to know the range, and a range-finder should always be carried. In the absence of artillery or range-finders the distance estimated should be tested by volleys, the observer going out to a flank to watch the result, which in ordinary cases will be easily perceptible. But if the bullets fall on turf, wet ground, or into furze, heath, etc., or behind a rise in ground, the effect cannot be seen at long distances even with a telescope."

The ammunition expended in these volleys will in every case be wasted as regards its destructive effect on the enemy, and in some cases it will be absolutely wasted.

Does not the system of firing with mixed sights, too, cause an unnecessary waste of ammunition? If the sights are set at three different ranges two out of every three rounds must necessarily be wasted, and it is quite possible that every single round may be thrown away through an entirely erroneous estimate having been made of the range. Whereas if the range-finder was used, with good marksmen, every round might be made to tell.

Now what is our position in the present day? Are not large sums of money being expended on accurate long range weapons? Are not we also spending days, months, and years in teaching our soldiers how to use them? And what do we teach them? Do we not always tell them to set their sights at such and such a range in order that they may hit the target? But it is we officers who always tell them the range.

The question is, can we and shall we always on service tell the men the true range of the object at which they are firing? I would suggest that we can, but I very much doubt if we shall.

We can if we will take the trouble to learn how to use our range-finders and to be sure that a certain number of men also know how to use them. But with our present knowledge of range-finding I fear we shall not.

Let us consider for a moment what the result is, if we do not tell the men the correct range. Is it not this? That the better shots we have trained the men to be in peace, the less will be their destructive effect in war. In peace we train a man to hit a mark at 1000 yards distance. In war we place that man 1000 yards from his mark and tell him that the range is 800 yards; of course he believes us, with the result that that man is harmless to the enemy, unless by a lucky chance he may hit some one whom he has not fired at, and of whose existence he is not even aware.

Now how is it that we devote so much time to teaching our men how to shoot at a given range, and so little time to teaching ourselves and a certain number of our men how to ascertain that range. Might I suggest that it is because we are disappointed in the results obtained on our first attempts to use the range-finding instruments with which we are provided.

Do we not often hear it said, "What is the good of a range-finder—no two men read alike?" Experience at the School of Range-Finding, in the advantages of which artillery only have as yet shared, has proved most conclusively that trained range-takers do read alike, and that it is the men who have not been trained, and who do not know the proper use of the instrument, who do not read alike. I have some statistics (for the years 1887–88) of the examinations which are held at the termination of each course. The average errors of all the classes for the two years were as follows:

AMONGST THE NON-COMMISSIONED OFFICERS.

At ranges under 1000 yards	- - -	1½ per cent.
Do. between 1000 yards and 2000 yards	2	"
Do. do. 2000 yards and 3000 yards	1	"
Do. over 3000 yards	- - -	1½ "

AMONGST THE OFFICERS.

At ranges under 1000 yards	-	-	-	1	"
Do. between 1000 yards and 2000 yards				1½	"
Do. do. 2000 yards and 3000 yards				1	"
Do. do. 3000 yards and 4000 yards				1½	"
Do. over 4000 yards	-	-	-	2¼	"

There is no doubt that greater accuracy than this can be obtained by constant practice.

If one takes up a billiard cue for the first time in one's life, one does not expect to be an expert at the game at once. Neither should one expect to be an expert range-taker the first time that one handles a range finder. I think the chances of being an expert billiard player at once are the greater, since the table is level and the balls are plainly visible, whereas the ground from which the range is taken, is broken and undulating, and the object to which the range is taken is often only visible from certain points. To take a range under service conditions requires practice, just in the same way that to play billiards requires practice. I would suggest that if officers and some of the men were thoroughly well trained in the use of the range-finder, we should no longer hear of "no two men reading alike."

Granted that range-finding is of the greatest importance to sustain an effective fire, and to prevent an unnecessary expenditure of ammunition, and also that it is of great assistance in surveying and reconnaissance, which I hope to show later, should not every regimental officer of every arm be an expert range taker, and every staff officer still more so? I believe that it is a very well-known fact that "as the officers are, so are the men," and consequently until officers are thoroughly accurate range-takers, we cannot expect to get good results from the men they command.

Moreover, however accurate our non-commissioned officers may be trained to take ranges at a school of instruction, unless they continue to practice taking ranges (not on the level parade-ground but on rough broken ground under service conditions) they will fall off in accuracy.

We require our range-takers to be constantly exercised, and to do this thoroughly our officers must be accurate range-takers.

It is such a very easy thing to "cook" a range. You tell the range-taker to take the range to such and such an object, he, wishing to be thought a smart fellow, very rapidly obtains something like the correct range, and gives this in as being correct; probably his range differs from the true range by 100 yards or more, but his officer not having confidence in his own abilities to take the range correctly, has no means of checking his result. The range-taker continues this bad habit, with the result that when the company to which he belongs goes on service, if it contains many good shots, it will not inflict much loss upon the enemy.

Then again has not the introduction of machine guns into the service increased the necessity for range-finding? With the machine gun the range cannot be picked up by trial shots even in the same degree that it can in the artillery, as there is no burst of shell to observe; but is it not of the first importance that a machine gun should open fire with a known range

the moment it comes into action? Consider the case of a machine gun engaging a battery at 2000 yards; if the men serving that machine gun know the range before they open fire, I think they will make the ranging of that battery rather an uncomfortable business. On the other hand, if the machine gun has to ascertain the range by trial shots, the chances are that the battery will have ascertained their range first.

I would now suggest certain ways in which range-finding can be adapted to the requirements of the service.

1. A rapid survey of an extensive tract of country could be made by a mounted party using the range-finder only, or the range finder in conjunction with the plane table or prismatic compass. The method would be to gallop from one salient feature to another, ascertaining by means of the range-finder the distances between them and the distances to any other important features, and plotting in the intervening country by eye.

2. Reconnaissance of ground about to become the field of battle of an army.

Standing upon some elevated position every visible feature can be noted on a rough sketch made without instruments, also the distances to these features and the distances that they are apart can be ascertained by means of the range-finder and recorded. In this manner much information, which I think would be invaluable to a staff officer, can be obtained. As this is the same system which might be applied to finding ranges in the attack and defense, both for infantry and artillery, I will describe it somewhat fully.

The general idea is that a force is holding a position and expects to be attacked, the ground in its immediate front being held by hostile cavalry.

The method of making the reconnaissance would be as follows:

An officer with range-finding party, or parties, would select some position from whence a good view of the country over which the enemy was expected to advance could be obtained. He would then execute a rough sketch of the principal features of this country, and would direct the range-finding parties to ascertain the distance to each of these features, the result of which he would record against them. In executing this sketch no attempt is made to draw to scale; buildings, woods, hills, roads, etc., are simply blocked in on the sketch as they are actually seen by the observer; the only rule to be observed is that any two or more objects which appear to be in line as seen by the observer must also be in line upon the sketch. Having ascertained the distances to these features he would calculate (by constructing similar triangles on the ground), the distances between them, which he would also record. In this manner, having accurately obtained the position of the most salient features of the country, they can at once be identified on a map of the district, or supposing no map exists, the information that is obtained is of still greater value.

It will be found convenient to make a reconnaissance of this description on several sheets of a note-book, since the features become too crowded if a very large field is sketched upon one sheet.

In the same manner a reconnaissance of a defensive position held by the enemy can be made. Would not this be particularly useful to staff and cavalry officers?

3. Reconnaissance of ground about to become the field of battle of the artillery.

(a) *The Attack*.—A sketch similar to that described above, would be executed from the position on which the battery or batteries are to come into action, and this sketch would be made before the battery took up its position. The ranges to every artillery position which the enemy are likely to occupy would be noted, also the distances to any closer positions on which the battery is likely to have to advance, and the ranges from the latter would be calculated.

(b) *The Defense*.—The same system is employed. In this case the ranges should not only be taken to the enemy's probable artillery positions, but also to intermediate points between these positions, so that the enemy may be under fire whilst they advance or retire from one position to another.

It might also be advisable to take ranges to points in advance and in rear of the position occupied and calculate the ranges from these points to the enemy's probable artillery positions, which would be useful in case the battery was ordered to advance for counter-attack or to retire.

This system of taking ranges for the artillery is nothing new. In the *Manual Field Artillery, 1881*, under the heading "Range Finding in the Field," we read: "on the defensive, ranges should be taken to all points which may become important during the course of the operations. These ranges may be conveniently recorded on a rough but clear sketch, having the points numbered and the numbers tabulated with their corresponding ranges." And again: "When the line of advance or retirement of a battery may be nearly or actually in prolongation of its line of fire, points should be taken in the next probable position by the range party; these distances deducted from or added to the existing range will give that of the new position."

4. Reconnaissance of ground about to become the field of battle of the infantry.

In advocating the following system of obtaining ranges, I do not in the least mean to suggest that the infantry can dispense with a range-finder which will give ranges rapidly and to moving objects. There is no doubt that in actual warfare cases will be constantly occurring in which infantry have to attack or are attacked unexpectedly, when there will be no time for deliberately ascertaining the ranges to points in the line of advance. In such cases a range-finder that will give the ranges very rapidly and to troops in motion is absolutely necessary; but when the attack is delivered as previously arranged, I would suggest that some such system as the following would be useful, and I am encouraged in this belief by the Adjutant-General's circular memorandum to general officers commanding at home and abroad, on Field-Firing for the year 1887-88.

"In no instance has a really practical system of range-taking during the advance to a position been reported. It is suggested that in the earliest stage of the attack, the distance of the enemy's position, and several prominent objects in the line of advance, should be accurately taken and communicated to all concerned. With these guides the approximate distance throughout the advance could easily be calculated."

(a) *The Attack*.—The officer commanding the battalion on receiving orders that he is to attack an intrenched position A from the road near C, at once sends on an officer with the range-takers of two or more companies who select a convenient position C, as much under cover as possible, from which a good view of the ground between C and A can be obtained. The officer makes a rough sketch of what he sees in front of him, noting the most conspicuous points, such as a distinct tree, tuft of grass, patch of heather, mound of earth, or light patch of ground. He directs the range-takers to take the range to all these points (two observations should be taken if time admits) and records on his rough sketch the actual distances between the enemy's shelter trench A and the object observed.

For example, the range from C to A is found to be 2110 yards, this he records opposite C. The range from C to the "dark bush" which is about 200 yards on the left of the line of sight is found to be 980 yards, he records 1176 yards opposite "dark bush" which range he arrives at by deducting 980 yards, the range actually found, from 2110 yards the range of the position from the point C, and adding 46 yards for the deviation from the line of sight.

A rough rule for making allowance for this deviation from the line of sight is to add

3 when the object to which the range is taken is 50 yards from the line of sight.						
11	"	"	"	100	"	"
16	"	"	"	125	"	"
27	"	"	"	150	"	"
37	"	"	"	175	"	"
46	"	"	"	200	"	"

This is calculated for a line of sight from 1700 yards to 2200 yards.

On the battalion arriving at the point C a copy of this sketch is given to the officer commanding the battalion and to each of the officers commanding companies, and the objects which have been noted on the sketch are pointed out to them; or some other means is taken to acquaint them with these ranges.

In the case of the ground about C being held by outposts, the outposts themselves would first have to be driven back; and to obtain the ranges for this preliminary attack, a similar sketch might previously have been made.

(b) *The Defense*.—For the defense I would suggest that similar sketches be made by every company in the firing line of the ground in its immediate front. In this case the actual ranges found would be recorded and time would admit of the ranges to a great many points being noted and verified by means of two or more observations.

The advantages of this system of obtaining the ranges appear to be :

1. The ranges are taken coolly and deliberately without the range-takers coming under fire. If time admits more than one observation can be taken to each point.

2. The officer commanding each company is provided with a sketch which not only gives him the range from certain points in the line of advance to the position attacked, but also gives him the distances between certain points which will afford cover during the advance.

3. The officer commanding the battalion can at any moment by glancing at this sketch see how far distant the firing line is from the position attacked, the supports from the firing line, and the main body from the supports.

4. The ranges are taken previous to the advance to attack, or the commencement of fire in the defense, so that the range-takers are free to move with their companies and to take any intermediate ranges that may be required; and this system further serves as a check upon these intermediate ranges which are taken rapidly under fire.

Taking this system of sketching and range-finding as a whole, the advantages it offers would appear to be:

1. The system is practically the same for reconnaissance, the attack and defense by artillery and the attack and defense by infantry.

2. The sketch executed in I., Reconnaissance of ground about to become the field of battle of an army, gives some of the ranges required for Sketch II., Reconnaissance of ground about to become the field of battle of the artillery. In the same way Sketch II. gives some of the ranges required for Sketch III., Reconnaissance of ground about to become the field of battle of the infantry.

3. The method of executing these sketches is most simple, and does not require the art of a draughtsman.

4. In many cases a large scale map could be used to ascertain some of the ranges.

5. Range-finding and rapid military sketching and reconnaissance of ground which is about to become the field of battle are brought into close connection with one another, much to the advantage of both.

6. This system of taking ranges when attacking and defending a position, and recording them on a reconnaissance sketch, affords an excellent opportunity of testing the abilities of the range-takers.

The range-finder can also be used with advantage in military sketching.

In making a military sketch of an area of rough broken ground, if the services of a range-finding party can be obtained it will in many cases be found more expeditious, and far more accurate, to substitute range-finding for pacing.

The advantage of using the range-finder in military sketching appears to be:

(1) A great saving of labor.

(2) Interpolation only requires the position of one point to be fixed.

(3) Nothing is an obstacle to fixing the position of any particular visible feature.

(4) It is impossible for inaccuracies, such as dropping 100 yards in pacing, to occur.

Ranges can be taken by night as well as by day to any light or illuminated object. This should enable field guns to extinguish the electric light.

Again, suppose it was required to exaggerate the strength of a force, each of the six guns of a battery could be sent to different points on the flanks of the camp at night. Knowing the exact range of the enemy's camp-fires an effective fire could be opened from these six guns which would represent the fire of six batteries, without drawing any fire upon the camp.

Would not night range-finding be of great assistance in directing the line of march in the case of a night attack? On the day preceding the night which was fixed upon for carrying out the attack, a flag-staff would be erected on some high ground in the proximity of the camp, and the bearing of the enemy's position from this point would be noted. As the troops advance by night on the enemy's position, the exact spot on the map on which they are standing could at any moment be ascertained by taking the range and the bearing back to a large lantern hoisted upon this flag-staff.

RANGE-FINDING AS AT PRESENT IN THE INFANTRY.

At most field days there is a considerable amount of ammunition expended. In the attack we see infantry advancing by rushes, halting to fire, and again advancing; after each successive rush forward the rifle sights must be set for a different range. In the defense infantry are firing on troops advancing, the range to which is ever varying.

Now are these ranges simply guessed at? Or are the range-takers constantly taking the ranges whilst they advance with their companies?

If the former, we can hardly expect the men to hit. If the latter, the range-takers will be under fire whilst making the observations, and will have the smoke of both their own company and the enemy to obscure their view. This last is, in cases of a sudden unpremeditated attack, an unavoidable evil, and therefore it is absolutely necessary to have a range-finder that will take ranges rapidly and to troops in motion.

But would not both these evils be obviated in a great measure, in many cases, by adopting some such system of taking ranges to points in the line of advance, as previously described.

If it be granted that to know the range is of vital importance, should we not have at least one officer and four non-commissioned officers in each company of infantry who are expert range-takers, and should there not be two sets of range-finding instruments for each company?

We must further consider what constitutes an expert range-taker. Is he not a man who can take ranges accurately to natural objects and to troops in motion, under service conditions, whilst making full use of any cover which the ground may afford? Can we expect any man to be able to do this with less than a month's continuous training?

Again, range-finding instruments require periodical inspection. I am well aware of Army Order 177 of 1888, which directs that range-finders and range-finding equipment belonging to regiments or battalions at home will be inspected annually by the Inspector of Musketry of the district; but is it at present possible to carry out an annual or biennial inspection of the instruments in use in the infantry? That the present system is not altogether satisfactory I gather from the Adjutant-General's Circular Memorandum on Field Firing, which I have quoted above: "Range-finders, however, have not always assisted the firing line. In some cases the instruments have been in bad order, in others those using them have been insufficiently trained."

It is not for me to say how these things are to be done, but would it not be advisable to have some such system established as that carried on at the

Army School of Signalling, by which a certain number of officers and men from every regiment of infantry and cavalry, and from every battery of artillery, could annually be thoroughly trained in range-finding, and also some uniform system of inspection of instruments adopted? We should then have expert range-takers.

Having obtained the expert range-takers, if some such system as has been described were practised on every field day, and the men told the correct range on every occasion on which they fired their rifles, the man-killing power of our army would, I think, be almost doubled.

RANGE-FINDING AS AT PRESENT IN THE ARTILLERY.

Artillery range-finding is such an important subject that it cannot receive justice in a general paper of this description.

At present the artillery only have the benefit of instruction at a School of Range-Finding; they also have a system of annual inspection of instruments, which has been found to work well. But only a very limited number of officers and men can be passed through the School in the course of the year, and consequently batteries cannot be kept supplied with as many trained range-takers as is desirable.

But do the artillery make every possible use of the power they possess of finding the range without indicating the position from which they are about to open fire?

The usual method of finding the range is as follows. I quote from Major-General C. H. Owen's lecture on Artillery lately delivered at the United Service Institute:

"Ranging a battery:

- "(a) Finding the long bracket.
- "(b) Finding the short bracket.
- "(c) Verifying the range.

"The bracket being the distance between the ranges of two shells, one under and one over the object."

This operation will take at least ten minutes, the fire being deliberate in order that the position of the burst of each shell may be observed.

General Owen again tells us: "It is important to come into action quickly, artillery serving merely as a target while doing so." And yet we take ten minutes or more before we open an effective fire.

Not only do we make ourselves a defenseless target for this considerable length of time, but we let the enemy know exactly where we are by firing single guns slowly and deliberately to mark our position.

We form a general estimate of how far distant the enemy is by means of the range-finder, but we are not to believe that the instrument can really give us the true range, although there are some who believe that it can do so. We are driven to remain under fire whilst we with our own eyes judge where each shell strikes, and we have to judge this at a distance of perhaps 3000 yards. Having obtained the short bracket, we must now verify the range by firing several rounds, still very deliberately and slowly. If our verification shows us that we have made a mistake in our previous estimate, which

may be possible, as we are judging distances at a range of 3000 yards, we must spend another ten minutes repeating the process.

But then supposing another battery is in action against the object to which we are endeavoring to find the range; shall we then be able to distinguish the burst of our own shell from that of the other battery? If we cannot must not we adopt some fresh means of ranging the battery which we have never practised before? As an illustration of this difficulty I quote an example from the Franco-German war, taken from Prince Kraft's *Letters on Artillery*.

"I am now relating to you my personal experience at the battle of Sedan. * * * Then happened all the difficulties which I have just narrated, while the enemy was firing hotly on us, I had nothing left to do but to first cease firing all along the line, then to lay every gun accurately and to order the batteries to fire salvoes, so that I might get more certain results from a group of six bursts."

These difficulties which he alludes to, were caused entirely by the smoke from the burst of his own shell and those of the enemy, and in order to find the range by trial shots, we read that the whole line of guns had to cease firing, and stand still to be pounded by the enemy.

Now if we can but ascertain the range correctly with the range-finder, and if we will but believe it to be the true range that is so found, knowing the condition of our ammunition, we can open an effective fire upon the enemy the moment that we arrive in our position, and the effect of this fire will possibly be the first intimation to him that we have taken up this position. That the present system of "Ranging a Battery" is not altogether satisfactory, I conclude from the report of the commandant, School of Gunnery, on the practice of the horse and field artillery batteries at Hay and Okehampton last year, which no doubt every artillery officer has read. Amongst other things the commandant says: "When a range-finder is not used, or is not trusted, ten rounds would, under many circumstances, not be too much for this purpose: the French allow twelve rounds."

Thus we see that supposing a battery has to find the range of three different positions during an action, it must expend thirty rounds of common shell, weighing over 3 cwt., in doing so. These rounds, as far as any destructive effect on the enemy is concerned, must be absolutely wasted, and not only will they be wasted, but they will be the means of indicating to the enemy the exact position of the battery.

Again let us consider what information we give to our opponents by this system of ranging by trial shots, and the measures they will take for their own safety on receipt of it. I quote from the *Infantry Drill Book* of 1889: "The fire of common shell by the enemy will generally precede that of shrapnel: the short pause between the two will give an excellent opportunity for the skirmishing line to push in, in which case the enemy's battery will have to find its range again.

"If the enemy fires a salvo, it often indicates that the infantry is so well placed that it is difficult for him to observe the effect of his fire.

"One or two shrapnel which burst well in front of advancing infantry often mark the spot on which the enemy intends to open a rapid fire of

shrapnel when he considers that the infantry are within reach of the bullets. The intervening space should be crossed as quickly as possible."

All the above information the infantry obtain by this system of ranging the battery by trial shots, and none of it would they have obtained if we could but use and believe the range-finder.

It has been stated by men in high authority that the effect of artillery is chiefly moral; a statement which, by the way, is disputed by many. However, no one will deny the fact that if a 12-pdr. shrapnel shell bursts in the right place, with regard to a gun detachment, its effect upon that gun detachment will be something more than moral: and we cannot be sure that in the next war in which we are engaged our opponents will not burst from thirty to forty such shrapnel shell in the right place, with respect to our batteries, during the ten minutes in which we are endeavoring to range the battery, thus pouring over 6000 bullets upon us. If this should happen, I am afraid our chances of coming victorious out of that war are but small.

The instructions for practice of horse and field artillery batteries this year allow us to proceed to find the short bracket at once. Cannot we hope that at some future date, when our range-takers are more efficient and we thoroughly understand the rate of burning of our powder, we may be able to accept the range found by the range-finder as the true range of our guns?

REMARKS UPON INFANTRY ATTACK.

(Translated from La Revue du Cercle Militaire.)

BY 1ST LIEUT. ALEX. T. DEAN, 4TH CAVALRY.

"**L**A REVUE DU CERCLE MILITAIRE" has published a series of contradictory articles on "Infantry Attack."

It is not for us to decide, but we ask permission of the readers of the *Review* to add a few words to the excellent arguments already employed against the offensive without halts—the uninterrupted march forward—which is advocated in the article published in the number for February 1, 1891.

According to the author of the article, from the moment when the enemy opens fire, the attacking force must halt no longer. The men charge and fire while marching.

The strengthening of the line is obtained by forcing the pace in the rear échelons.

The idea is not new. It has already seen the light in a scheme of tactical regulations given for study in 1888 and due, we believe, to the suggestion of General Fernir, but notwithstanding the high authority under which it sought shelter, it soon succumbed—condemned by the unanimous opinion of the military press, and the adverse reports of army corps commanders.

This idea of a continuous advance may indeed be particularly attractive

to young officers, whose ardor inclines them to go ceaselessly forward, but it hardly bears a close examination, as we will try to demonstrate.

As the author of the article says, the two essential factors of every combat are motion and fire, consequently our object must be to obtain from each one of these factors its maximum of usefulness. Let us therefore study separately each one of these.

1st. Firing, in order to be effective, must be executed steadily and coolly, applying as much as possible the experience gained from manœuvres and exercises practised in the time of peace, and the rules deduced therefrom.

Supposing the men led by their chiefs and obedient to their orders, with regard to the object in view and the commencement and cessation of firing, can these rules be punctually observed in war? Evidently not, but it is precisely because they are more difficult to follow, that we must endeavor to place ourselves within conditions which will enable us to swerve from them as little as possible. What results shall we get from a fire executed while marching in an irregular manner, without commands, according to the fancy of men authorized to open fire at the extreme range of the weapon?

The men, excited by the march, will fire at haphazard, without shouldering, without aiming, just as long as they have cartridges. They will get absolutely beyond the control of their chiefs. Their fire will degenerate into a useless shooting, and their ammunition will soon be exhausted. To hope that while allowing the soldiers to fire according to fancy the consumption of cartridges can still be regulated is a singular delusion. The lack of discipline, as regards firing, implies unavoidably a waste of ammunition.

The first line will reach the position of the enemy (if they ever get there) out of ammunition, and at the mercy of the slightest offensive return.

Certain officers (we know such personally) refuse indeed to admit the influence of previous target practice in actual fighting. They claim that in war men all fire before them at haphazard, that is to say, their value is equal. This theory is rather paradoxical, and it is far truer to say that the excitement of the fight, and the intoxication caused by firing, will act least on him who has received the most solid instruction and training, who best understands the use of his weapon, and the result which may be expected from it.

It is this intoxication, this blind way of firing, contagious in the highest degree, and particularly to be feared from its infallible tendency to cause waste of ammunition, disorder, often even panic. It is this species of mania, we say, the development of which must be prevented by all means. This end will be obtained by an even and methodical mode of marching, during which the men will make the best of any shelter afforded by the nature of the ground in order to stop, breathe a while, reform themselves in line, fire a few cartridges under conditions of calm and security indispensable to the execution of good firing, then recommence the movement forward by échelons, the only means to gain ground under the enemy's fire. Another point we must bear in mind, this fire of an enemy, posted behind cover, will be in the future much more terrible for the assailant, in that he will no longer be concealed by the cloud of smoke, which, in the past, has formed before him a veil impenetrable to the sight. Certain ingenious minds have

indeed proposed various means to produce this cloud before the line of attack, but the means proposed have not yet passed into practice, and do not seem at present to be of very easy application.

2d. Motion. Man does not move without fatigue. On a barrack square or drill ground he easily passes over the 1000 or 1500 metres which separate him from the imaginary enemy, because the ground does not oppose obstacles to his march, but on the field of battle, when he must cross ploughed fields and crops of various kinds, jump ditches, straddle hedges, etc., must we not fear that, if no rest be allowed him in his forced march, he will reach the goal harassed, out of breath, without strength to produce the final shock, or to resist the counter attack and offensive return that the adversary will not fail to attempt against him, and if this is true for the fighting line, it will be still more so for the supports and the reserves, forced as they will be to quicken their pace in order to rejoin at the proper time, the first line. The chain which fires while advancing, says the author of the article, can practice no other gait than "quick time." The reserves, in order to reach the main line, will singly take up "double time." Just imagine this steeplechase, executed by solid bodies of men, across ground cut up by obstacles of all kinds. How many men will reach the objective point and in what state will they get there? At any rate, the weakness of an attack conducted in this manner can be demonstrated on mechanical principles. The effect of a shock being the product of the striking mass by its velocity, it is clear that if this velocity is consumed during the march, the mass tends to become inert at the moment of arrival.

The force of the shock diminishes down to the point of becoming useless if the velocity itself falls to zero. Finally, it is a mistake to believe that motion is protection. The truth is that motion must take the place of shelter when this does not exist, and that troops must never be kept motionless when exposed, without cover, to the fire of the enemy. Let us now combine the two factors, fire and motion, and suppose a body of infantry, marching to the attack, without halts and while firing. What happens? Can we admit that the first line will preserve an alignment sufficiently accurate to permit each man to fire without interfering with the fire of his neighbors and without danger to them? Evidently not. The minor obstacles which strew the ground will retard the march of some of the men, others carried away by their ardor, will quicken the regular gait of the march, others less impetuous, wounded or fatigued, will, on the contrary, go slower. In short, the chain at the end of a few minutes, will no longer resemble a straight line, but a zig-zag formation. That happens in time of peace, on the drill ground, despite all efforts to prevent it, how can it be otherwise in battle?

We must, indeed, have formed very peculiar notions of a battle-field, if we believe that the young troops of our day can be marched there as easily as on parade. We have seen an instance of it on the day of Serigny. We shall not see it again in future wars. Besides, this firing, executed while marching, singularly favors the formation of that zig-zag line. The mere fact of allowing soldiers to halt at will, in order to fire, implies the rupture of the alignment, and the production of numberless indentations in the chain. Under these conditions, is it likely that the men can fire without

danger to their neighbors? This cannot be admitted. Our men would shoot each other point blank, until panic took possession of them, and made them turn their backs to the enemy. Let us be wiser, and not allow ourselves to be carried away by that avidity for the new which so easily takes hold of a mind weary of turning ever in the same circle.

True progress consists, as a rule, in perfecting the means at our disposal and not in inventing absolutely new ones. Indeed, it is not forbidden to search for new methods, but before generalizing the application of them, we must be very certain of the results that they will give. Here the result cannot be doubtful. The offensive without halts is not progress. It is a step backward. It is a return to the primitive methods of attack of the warriors of antiquity when adversaries could approach each other without danger up to four metres and even nearer. It is disorder raised into a principle. The mob substituted for tactical formations, a mob powerless and doomed to certain disaster, whether it be destroyed by the enemy's fire, or impelled by fear to turn and run away, naturally without any further halting. A poor mechanic, says the proverb, has never yet found good tools. Let us be good mechanics, and avail ourselves of the means placed at our disposal by the regulations of 1889. Are those regulations already out of date? No one can seriously make such a statement. Only one new factor has appeared since that time, calculated to introduce certain modifications in our fighting tactics. That is smokeless gunpowder, but the introduction of that element is too recent to permit us to formulate a reasonable appreciation of the consequences. We are still within the period of experiments and discussion. But what fault is found with the regulations of 1889? One says that it has weakened the offensive principle which was the base of that of 1884. This is an error. That principle thoroughly pervades the new regulations. These recommend it is true, and with reason, that we avail ourselves of such positions as favor the execution of the firing, but far from diminishing the vigor of the offensive, they permit in certain cases, a sudden attack, without passing through a succession of bounds, a liberty which the old regulations did not give, and which leaves the judgment and initiative of the commander unhampered. To generalize this method of action would be a mistake. The sudden attack must be the exception.

THE PRINCIPAL ARTILLERY QUESTIONS OF 1890.

*Translated from the Revue de l'Armée Belge.**

By LIEUT. J. C. BUSH, 5TH ARTILLERY.

PERSONNEL:—In Germany the formation of the 16th and 17th army corps, decreed by the law of January 27, 1890, was accomplished the 1st of April following. This carried with it the creation of 4 new regiments of field artillery, of which the elements were taken mostly from the old units. This led to a new grouping of the batteries and groups.

The German field artillery now comprises 20 brigades formed of 43 regiments having 130 mounted groups,—124 of 3 batteries each and 6 of 2 batteries each; 22 horse battery groups,—20 of 2 batteries each and 2 of 3 batteries each; 1 mixed group of 4 batteries,—3 mounted batteries and 1 horse battery,—a total of 434 batteries of which 387 are mounted and 47 are horse batteries, besides one group of three instruction batteries for the Firing School of field artillery. (Lieutenant Wernigk, "Taschenbuch für die Feld-Artillerie.")

In Austria, January 1, 1890, a 6th battery was added to each one of the 14 regiments of corps artillery. The Austro-Hungarian artillery now comprises 14 brigades of artillery, consisting of 14 regiments of corps artillery; 28 groups of independent mounted artillery and 1 group of independent mountain artillery; 70 groups of mounted artillery, 3 batteries of 8 guns each per group; 8 groups of horse artillery, 2 batteries of 6 guns each per group, and 1 group of 3 mountain batteries,—a total of 241 batteries of which 210 are mounted, 16 horse and 15 mountain artillery. (Captain Schubert, "Die Feld und Gebirgs-Artillerien der Europäischen Staaten im Jahre 1890.")

Regarding France we may remark that since the formation of a 12th battery in each of the corps artillery regiments, as prescribed by the law of July 15, 1890, the field artillery comprises 19 brigades formed of 38 regiments having 133 mounted groups of 3 batteries each, 19 groups of horse batteries of 3 batteries each, of which 2 groups are intended for the corps artillery and 1 group detached, or to be detached, with the divisions of independent cavalry,—a total of 460 batteries of which 403 are mounted and 57 horse, besides 20 mountain batteries. (Captain Schubert, "Die Feld-, etc.")

The Swiss have thought it necessary to specialize more their artillery troops. Some years ago they organized position artillery and by an order of April 11, 1890, the Federal Council created a special branch of fortress artillery of which 4 companies have been organized. The personnel is armed with repeating rifles. (*Revue Militaire de l'Etranger*, 1890, No. 742.)

The number of practice grounds in Germany has been increased from 9 to 10. The Minister of War has caused 3000 hectares (7410 acres) of ground

*Tome II., 1891.

13 kilometres (14,217 yards) long to be purchased at Arys, Eastern Prussia, close to the Russian frontier. (*Allgemeine Militär-Zeitung*, 1890, No. 86.)

Field guns :—Germany has solved the question regarding uniformity of calibres for its field artillery by giving the 8.8c (3.47 in.) gun to the horse batteries as well as to the field. (*Revue de l'Armée Belge*, tome III., 1890.)

Austro-Hungary seems about to follow this example. After ordering uniform calibres for the mounted batteries, which will all have 8.7c (3.42 in.) guns in 1891, she has begun to study the construction of a light gun of this calibre, to replace the 7.5c (2.95 in.) guns, for the horse batteries. (Captain Schubert, "Die Feld-, etc.")

The Austrian artillery has adopted a combination fuse as a result of the trials related in the preceding volume of the *Revue de l'Armée Belge*, page 91. A combination fuse was adopted in France in 1880, in Sweden in 1885, in Germany in 1886 and in Italy in 1887. It has also been adopted in England and Switzerland.

Modern field guns, whose shell and shrapnel have only a grazing effect, and in depth alone, are unable to reach troops standing close in to cover. Thus, when the defenders of a work are seated on the banquettes, back to the parapet, they can only be struck by projectiles or fragments arriving under angles of fall varying from 20° to 45° according to the profile of the covering mass. Now troops disposed in this manner, and defiladed under an angle of 25°, are, at a distance of 1900 metres, sheltered from the plunging shrapnel fire of the 8.7c (3.42 in.) Austrian guns (and we know that this artillery is the only one which has introduced small charges in its field material, which moreover is not constructed for plunging fire). At 3500 metres (3826.7 yds.) troops under similar cover have nothing to fear from the German shrapnel of 8.8c (3.47 in.) with a high explosive charge. It follows that if the defense is content simply to line the parapets at the moment when the attacking artillery becomes silent in order not to hit its own columns, the latter will find themselves engaged in a struggle with intact infantry, and at the critical moment will receive no aid from their own artillery.

Two very different methods have been tried for remedying this defect in the present field guns; first by supplying torpedo-shells of great length and consequently large explosive charge; second by creating a field gun especially adapted to plunging fire. Let us examine briefly the application of these two solutions which have been made in different countries.

Field torpedo-shell :—Following the example set by Germany whose torpedo-shell (Sprenggranate) dates from 1888, France adopted a similar projectile in 1890. Austro-Hungary has experimented with these shell for two years, and their adoption is near at hand. The trials have reached the stage when, in case of necessity, they can be introduced immediately into the battery supplies. (Lieut. Christl, *Streffeur's österreichische militärische Zeitschrift*, May, 1891.)

We know nothing of the French torpedo-shell, made for the 90 mm. (3.5 in.) gun alone. It seems only intended to act as a mine, if we can judge by the following sentence found page 301 of the *Revue Militaire de l'Etranger* for April in an article relating to the employment of plunging fire in

the field :—"These shell enable us to throw down earthen parapets without having recourse to plunging fire. The parapet once destroyed, the men behind it are almost without defense against shrapnel fire."

Germany, on the contrary, as well as Austria, intends to act directly against troops under cover by means of flying mines. This projectile, 7 kilogrammes (15.4 lbs.) in weight, gives an average of 800 fragments (the Austrian ordinary shell gives 120) of which 200 weigh over 10 grammes each, and 600 between 1 and 10 grammes each, besides 840 grammes of lesser fragments. The velocity of these fragments at the moment of burst is very great (800 metres, 872 yds.) so that, after deducting the remaining velocity of the projectile, the fragments towards the base of the shell are thrown to the rear with a velocity of from 400 to 500 metres (436 to 545 yds.) and can then strike in reverse the soldiers leaning against the covering mass. Employed as percussion shell, the torpedo-shell is influenced much more than the other by the nature of the ground into which it falls. Its effect is less than that of the other for small and medium distances, but at great distances it is more considerable.*

They have also returned to its employment as an exclusively percussion shell and have supplied combination fuses. It is set as percussion against exposed objects when searching the enemy's position with horizontal fire. It then produces more effect than the ordinary shell when it strikes the object, and the fragments fly back to the rear. Because of this last characteristic it has a certain effect when it falls beyond the object—a case in which the ordinary shell would be entirely inefficient. (German firing regulations for field artillery, 29 of May, 1890. Lieut. Christl, *Streffleurs*, etc.)

Field pieces for plunging fire :—These pieces may be either howitzers or mortars.

They present the following disadvantages when compared with field guns :—An equal number of carriages and a smaller quantity of ammunition—about half for the 12c calibre and one-fourth for that of 15c (5.9 in.)—the transport of the cannoneers is rendered impossible on account of the weight; the fire is slower and the time of flight greater; the battery can offer little resistance against surprises; their fire can hardly be directed against other than fixed objects; on account of the great angle of fall and the small remaining velocity, the special action in depth or range is more feeble—this requires a more precise adjustment.

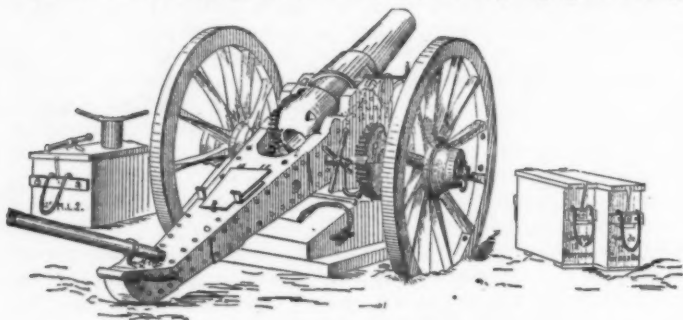
On the other hand, the regulation of their fire is easier, the strong charge contained in their projectiles produces a greater and more opaque cloud of smoke. Besides the material effect, the moral effect is greater in proportion to the size of the charge. The accuracy of their fire is greater, the errors in pointing having less influence on the range. They can be placed nearer to the covering mass, thus affording better shelter from the enemy's shot and facilitating communication between the battery commander and his men. The 15c piece is the more powerful, but within the limits of weight allowed for field pieces, the supply of ammunition must be small, and this

* According to the German firing regulations for field artillery, they can only count on the effect of a shell when the distance from the point of fall to the object fired at does not exceed half of the danger space.

weapon should be a mortar, which would limit the range to 3000 or 4000 metres (3270 to 4360 yds.).

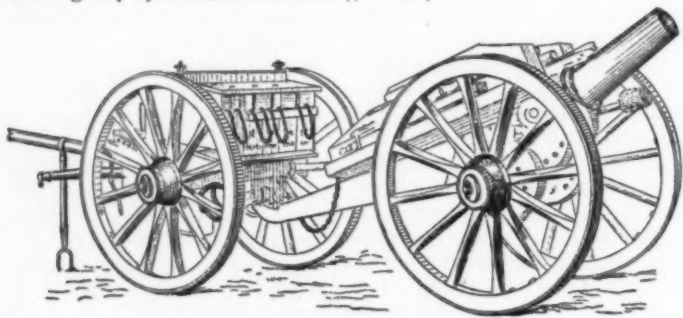
If the 12c (4.7 in.) calibre is less effective, the number of projectiles carried is larger; the piece can be a howitzer with a range from 5000 to 6000 metres (5450 to 6540 yds.). The 12c (4.7 in.) projectiles cannot destroy all cover found in temporary works, but they can penetrate the majority of them.

Material:—Switzerland has constructed a piece for plunging fire arranged



SWISS 12CM FIELD MORTAR.

as a field gun. She has possessed since 1885 a 12c (4.7 in.) howitzer which she improperly calls a mortar, its length being $12\frac{1}{2}$ calibres. The piece complete, gun, carriage, platform, limber with 10 projectiles, weighs 2200 kilos (4840 lbs.). Krupp commenced in 1886 to experiment with a field howitzer of 12c (4.7 in.), 12 calibres in length, the total weight of which, including 16 projectiles, is 2100 kilos (4620 lbs.).



SWISS 12CM FIELD MORTAR.

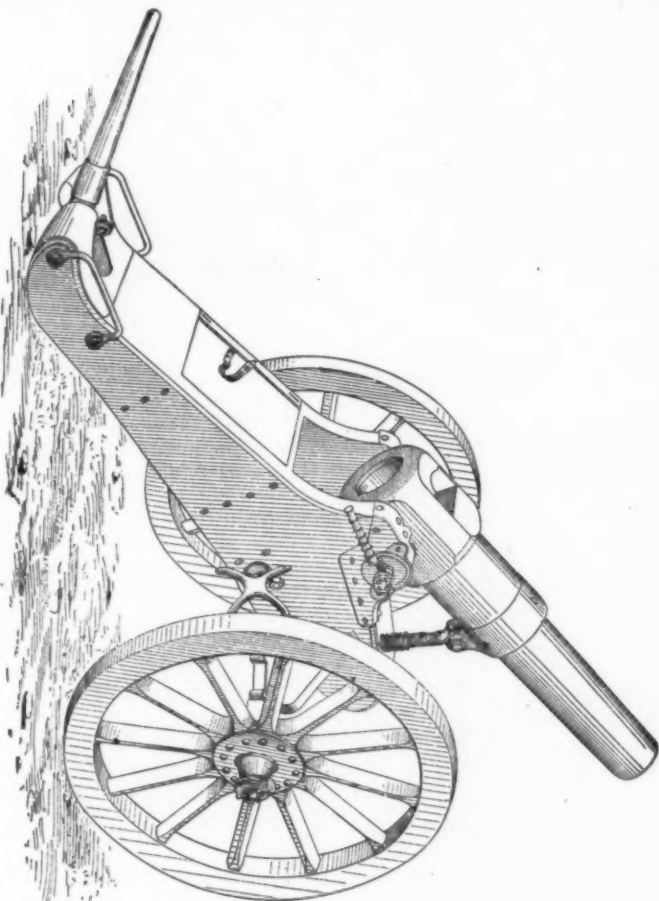
Gruson produced in September, 1890, a 12c (4.7 in.) rapid-fire howitzer 13 calibres in length, mounted on a field carriage, the total weight of which, including 20 projectiles, is 2100 kilos (4620 lbs.). Having given this number of projectiles and the time of flight, we might ask whether it is advantageous to seek for a greater rapidity of loading at the cost of introducing an expensive and heavy metal cartridge case.

Austro-Hungary in 1888 undertook to experiment with a 12c (4.7 in.) howitzer having the same weight as the 8.7c (3.42 in.) gun without ammunition.

Sweden has also studied this subject of a 12c (4.7 in.) howitzer.

Russia has given preference to a 15c (5.9 in.) calibre. She possesses a

GRUSON 12CM RAPID-FIRE FIELD HOWITZER.



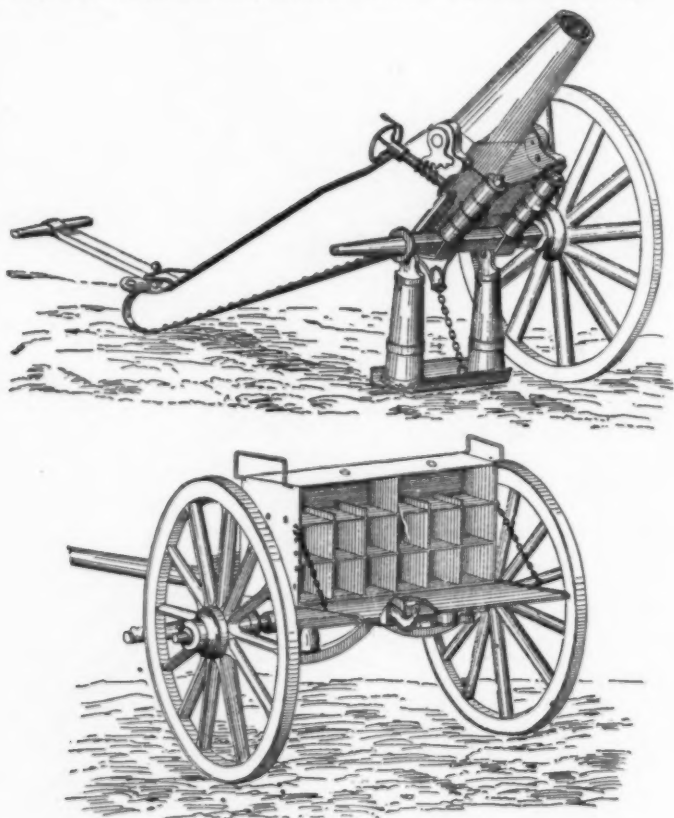
field mortar 9 calibres in length, weighing, with 12 projectiles, 1950 kilos (4290 lbs.).

Spain possesses also a field mortar of 15c (5.9 in.) 9 calibres long; the piece complete with 12 projectiles, weighs 2525 kilos (5555 lbs.) (*Revue d'Artillerie*, March, 1889.)

Krupp produced in 1886 a 15c (5.9 in.) field mortar, 8½ calibres long, weighing with 8 projectiles, 2068 kilos.

Germany commenced experiments in 1888 with a 15c (5.9 in.) field mortar. (Captain Schubert, *Die Feld-*, etc.)

Italy seems desirous of giving another solution to the problem. She is considering a field mortar of 8.7c (3.42 in.) calibre. This solution simplifies the question of ammunition, but does it solve the question effectively?



RUSSIAN 15CM FIELD MORTAR.

We may remark finally regarding calibres, that Holland possesses for colonial service, a mortar of 7.5c (2.95 in.) having a length of 6½ calibres and weighing 50 kilos (110 lbs.), especially intended for curved fire for shrapnel. (Captain Schubert.)

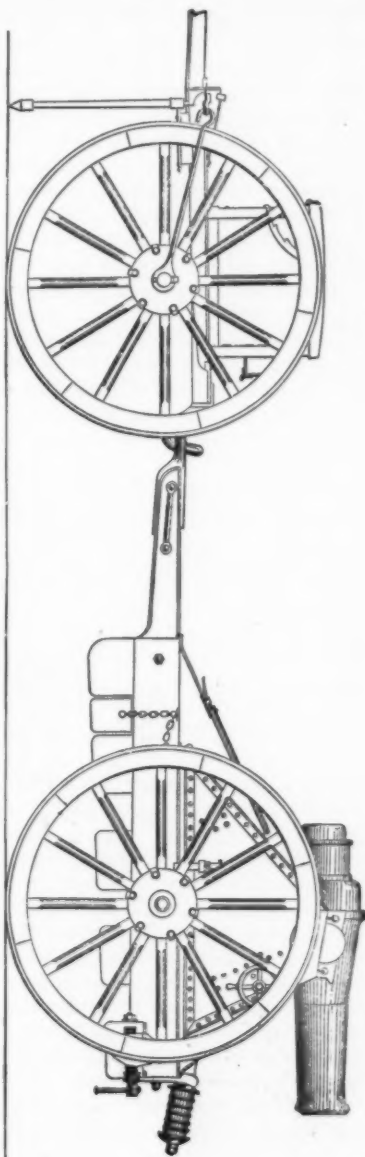
As elements of comparison with the howitzers, let us take the mean of the dimensions relative to the 9c field guns of the French, German, Russian,

Italian and Spanish artilleries, which we find in the work of Captain Schubert:—length of gun, 24 calibres; number of projectiles carried on the carriage and in the limber, 32; weight of piece complete, 2006 kilos (4413 lbs.) without cannoneers, and 2396 kilos with 5 cannoneers, allowing each of them a weight of 78 kilos (172 lbs.) (mean of the weights authorized in the services above mentioned.)

Personnel:—The Bavarian General von Sauer asks, that without diminishing the whole number of batteries, they assign 4 howitzer or mortar batteries to each army corps. (*Militär Wochenblatt*, No. 53, 1890.) An article which appeared in the January number of the *Jahrbucher*, under the title—"Special Batteries for the Field Army"—recommends a single battery per corps. We recall that Major Leydhecker of the German artillery objected to a group of 4 batteries per army in his article entitled "Plunging Fire for Field and Siege Warfare."

General von Sauer wishes to employ plunging fire from the beginning of the action, attributing an advantage to it over the grazing fire of the defense. The author of the article, previously quoted, proposes on the contrary to reserve this fire till the time immediately preceding the decisive assault and then direct it only against the point at which the enemy's position is to be assailed. Fifty shots per piece will suffice for this object

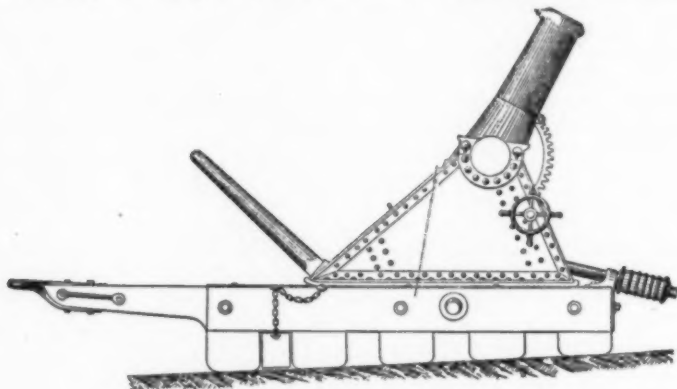
SPANISH 15CM SIEGE AND FIELD MORTAR.



which corresponds to a fire of $2\frac{1}{2}$ hours at the rate of $1\frac{1}{4}$ minutes between shots.

Up to the present time Russia alone has completed an organization, consequent upon the adoption of field mortars, by creating, in June, 1889, two mortar regiments, and in December, 1890, a third one. Each regiment comprises 4 batteries of 6 mortars each. (*Revue d'Artillerie*, July, 1890.)

Rapid fire guns:—Since the convention of St. Petersburg the permissible weight of explosive projectiles cannot be less than 400 grammes, which corresponds to a calibre of 3c (1.2 in.). The diameter of bore of the first rapid fire guns was but little greater than the minimum allowed, which then sufficed since the primitive object of this weapon was to fight torpedo boats. Step by step they have succeeded in applying the principle of the small arm cartridge to larger calibres; and have sought to counterbalance the substantial advantage which the small calibre repeating rifle has given to the infantry by increasing the rapidity of field artillery fire in the same proportion. They have not yet succeeded because the calibres now in use do not



SPANISH 15CM SIEGE AND FIELD MORTAR.

permit the suppression of recoil. Now the effect of rapid loading vanishes when it becomes necessary to run up the gun after each shot in order to point anew. It has been found necessary, therefore, to reduce the calibre, and the power of the gun remains below that required for field artillery. Perhaps the employment of smokeless powder will solve the problem.

However this may be, the navy, which is but little limited by conditions of weight and recoil, has already reached the superior limit of middle calibres in the construction of rapid fire guns.

The calibres of the Hotchkiss guns which figured at the Exposition of 1889, in Paris, varied from 3.7c to 10c. The 10c (3.9 in.) gun has a length of 42 calibres and weighs 1650 kilos (3630 lbs.). The cartridge weighs 25.3k or 26.3k (55.7 lbs. or 57.9 lbs.) according as it is a shell or shrapnel. The initial velocity is 600 metres (654 yds.).

The 10c, 12c and 15c rapid fire guns of the Canet system also appeared

at the same exposition, but experiment with them only took place in 1890. They are 48 calibres in length and weigh respectively 2100 (4620 lbs.), 3300 (7260 lbs.) and 6400 kilos (14,080 lbs.). The 12c cartridge case loaded weighs 34 kilos (75 lbs.), that of 15c weighs 67.400k (148 lbs.). The loading is performed easily by two men. The rapidity of fire of the 12c gun is from 10 to 12 shots per minute. In the trials at Sevran-Livry the muzzle velocity obtained amounted to 838 metres with a pressure of 2900 atmospheres. The living force corresponded to the perforation of a wrought iron plate of 24c (9.5 in.) in thickness, for the 10c gun and more than 40c (15.8 in.) for the gun of 15c. The Canet guns of 12c and 15c have been adopted for the armament of an armored vessel and two cruisers which the "Forge et Chantiers" are constructing for Chili. (*Revue d'Artillerie*, April, 1890.)

Armstrong at Elswick constructs rapid fire guns of 12c, 14c and 15.2c weighing respectively 2100, 4000 and 5600 kilos*. The guns of 15.2c form the auxiliary armament of the new English war ships. They even form, with guns of 12c, the principal armament of the Italian cruiser *Piemonte*, which the Armstrongs are constructing. The 12c gun has a length of $41\frac{1}{2}$ calibres; its charge of smokeless powder weighing 5.67k (12.3 lbs.) gives an initial velocity of 754 metres (822 yds.) which corresponds to the perforation of a plate $25\frac{1}{2}$ c (10 in.) thick. The rapidity of fire is 14 salvoes per minute for the 12c and 6 for the 15c (Jahrbucher, March, 1890.)

We observe that Gruson stops at an 8.2c (3.2 in.) calibre, for rapid fire guns (length 35 calibres, initial velocity 660 metres) (719 yds.).

In order to form an idea of the progress made in the last 30 years, let us compare these figures with those which relate to our material, model 1861:—12c cast-iron rifles of 22 calibres in length, weighing 1640 kilos (3608 lbs.), initial velocity 303 metres (330 yds.); 15c rifles, cast-iron, length 20 calibres, weight 1320 kilos (6864 lbs.), initial velocity 297 metres (324 yds.).

We have seen with regard to field pieces for curved fire that Gruson has constructed a rapid fire 12c howitzer. It is of steel in one piece with trunnions at the breech, weighs 470 kilos (1034 lbs.) is 13 calibres long, has a maximum charge of 0.360k (0.8 lbs.) of Nobel's smokeless powder in grains of $1\frac{1}{2}$ mm. The weight of the cartridge complete is 18.070k (39.7 lbs.). An initial velocity of 302 metres (329 yds.) for the shell of 16.400k (36 lbs.) with a pressure of 1500 atmospheres gives a maximum range of 5800 metres (6322 yds.).

Krupp and De Bange in Chili:—The artillery of Chili made comparative trials in 1890 of the field and mountain guns furnished by the Cail establishment in Paris (then under the management of Colonel de Bange) and by the Krupp steel works. The de Bange guns had the design of the French field guns of 80mm (3.15 in.) model, 1877. Those from Essen were model 1889, calibre 75mm, (2.95 in.) had the wedge fermature and used metal cartridge cases with smokeless powder. They were 28 calibres long and weighed 307 kilos (675 lbs.). The projectile weighed 5.85k (12.8 lbs.) and the charge 390 grammes (0.86 lbs.) The mountain gun had a length of 13

*Kilogramme equals 2.2 lbs.

calibres and weighed 103 kilos (226.6 lbs.). The projectile weighed 4.3k (9.5 lbs.) and its charge 135 grammes (0.3 lbs.).

After the trials the majority of the commission pronounced categorically for the adoption of the Krupp system but the minority expressed the following opinion :—" The new powder and metal cartridge cases, however advantageous they may be, place this country in a state of dependence to the Krupp manufactory. It is unfair to compare the de Bange system, dating back 13 years, with a Krupp design inspired by the important progress made since that time. The de Bange material has really excelled under other calculations with regard to precision, and if it has produced less effect under service conditions, this arises from the fact that the projectiles contain fewer segments or balls. Neither of the two contestants has shown such superiority as to impose an immediate decision. Moreover there exists still another system which in all calibres presents great advantages—the Canet system already adopted for the armament of the ships in course of construction." (*Jahrbucher für die deutsche Armee und Marine*, September, 1890.)

As a result of a similar trial between these two systems, Krupp and de Bange, at San José in August, 1890, the government of Costa Rica decided in favor of the de Bange guns, which excelled both as to range and precision.

Sea-coast guns :—The Krupp establishment has experimented with a howitzer of 29c, (11.2 in.) 11.6 calibres long and weighing 11,000 kilos.* The piece is mounted on a carriage with chassis weighing 14,000 kilos, resting upon a metallic platform weighing 45,000 kilos. With an armor piercing shell weighing 300 kilos (3.7 calibres long) and a charge of 26 kilos of prismatic powder, a velocity of 311 metres (339 yds.) was obtained; pressure 2170 atmospheres; range, with 45° elevation, 8323 metres (9072 yds.) with 55° elevation, 7665 metres (8355 yds.) with 65° elevation, 6073 metres (6619.6 yds.). Firing against plates has been carried out with these howitzers notably at 354 metres (385.9 yds.) against a plate of deck armor measuring 16 by 4 metres and formed of four sheets of steel plate superimposed and riveted together giving a total thickness of 89mm. Two projectiles struck the plate and perforated it, the first at an elevation of 45° with a velocity of impact of 186 metres and the other at 65° elevation with a striking velocity of 220 metres (239.8 yds.). (*Revue d'Artillerie*, November, 1890.)

The Schneider works submitted two guns of 24c (9.5 in.) for trial in February, which were ordered by the Chinese Government. Two other guns of this model were tested in September and October, 1889, having the interrupted screw fermature with composite obturator of the Schneider system (length 36 calibres, weight 20,300 kilos, 44,660 lbs.). The projectiles are an ordinary shell of 140 kilos (308 lbs.) and an armor-piercing shell of 164 kilos. The guns are mounted on a centre pintle sea-coast carriage weighing 31,200 kilos. The angles of fire vary from -7° to +25°. The elevation from one limit to the other can be made in 20 seconds and a complete rotation of the chassis effected in 3 minutes. The service of the piece

*Kilogramme equals 2.2 lbs.

requires 15 men. A velocity of 673 metres (733.6 yds.) has been obtained with the armor-piercing shell and 707 metres (770.6 yds.) with the ordinary shell, charge 87 kilos of brown prismatic powder.

The Forge et Chantiers completed in 1890 the construction of the first two of the three 32c (11.7 in.) Canet guns ordered by the Japanese Government for coast defense, but the trials only took place in the first days of 1891. This gun has a length of 40 calibres, say 12.80m (42 ft.), and weighs 66 tons. The diameter of the breech is 1.30m (4.2 ft.), and that of the chase 0.53m (1.6 ft.). The number of groves is 96 and the twist is constant after 30 calibres. A charge of 255 kilos of brown prismatic powder and one of 135 kilos of a special smokeless powder impressed upon a projectile of 450 kilos an initial velocity of 704 metres (767.4 yds) and 702 metres (765.2 yds.) respectively. This corresponds to a half-living force of 11,235 ton-metres in absolute value or 170 ton-metres per ton of metal. The internal pressure varied from 2200 to 2600 atmospheres. The maximum calculated range is about 21 kilometres (22,966.2 yds.).

It is a matter for remark that the Armstrong 110-ton gun of the English armored ship *Sans-Pareil*, the construction of which dates from 1888, has a length of 13.30m (43.6 ft.)—hardly 50 centimetres more than the 66-ton Canet gun. Its maximum charge of 435 kilos impresses upon a projectile of 816 kilos an initial velocity of 655 metres (713.96 yds.), which corresponds to a half living force of 17,851 ton-metres in absolute value, or 159 ton-metres per ton of metal. The perforation in wrought iron at the muzzle is 1.15m (3.77 ft.) for the Canet and 1.20m (3.9 ft.) for the Armstrong gun. We see from this that the Canet gun of half the weight has nearly the same power.

The Canet gun is to be installed in a barbette turret having an interior diameter of 7.20m and resting, through the medium of conical rollers, on a circular steel plate of cast steel fixed to the deck of the ship. The piece having no trunnions, is held in place by means of projecting hoops let into groves in a cradle which forms the carriage proper; this rests upon a chassis formed of two string pieces of cast steel. The angles of fire vary from -4° to $+10^{\circ}$. The total weight of the turret is 120 tons and that of the surrounding armor, which is formed of steel plates 30 centimetres thick, is 216 tons.

The loading can be performed in any position by means of a central tube. (*Revue d'Artillerie*, April, 1891.)

The Canet rapid fire gun of 15c, of which we have previously spoken, is mounted on a coast carriage to be manœuvred by electricity; this marks the first step in a new direction. The gunner makes no exertion, but simply moves a lever, without taking his eye from the line of sight, and elevates and directs the gun at the same time. The general direction is given very quickly, with maximum rapidity, and is afterwards completed by a slow motion. It can also be manœuvred by hand in case of accident to the electrical connections. (*Génie Civil*, No. 25, 1890.)

Armor plate trials:—The American Navy made comparative trials in September, 1890, at the Annapolis proving grounds of a Schneider steel plate 268mm thick, a Cammel compound plate of 272mm and a Schneider nickel-steel plate of 265mm.*

* Containing 3¼% of nickel or 5%, according to other sources of information.

The firing was carried out with a 15c gun 35 calibres in length, throwing an armor piercing shell of chrome steel made by Holtzer works near Unieux, and a 20c gun throwing a similar shell made by Firth works at Sheffield. The compound plate was perforated by all the projectiles, and its steel face destroyed. The two steel plates stopped all projectiles, the pure steel one showed a little more resistance than that of nickel steel, but it was seriously cracked by the 20c projectile while the nickel steel plate remained without cracks. As a result of these trials the American Congress voted a sum of one million dollars for purchasing a large supply of nickel.

The commission accordingly classed the three plates in the following order: 1, nickel steel; 2, steel; 3, compound. A comparative trial of the two kinds of projectile gave the advantage to that of French manufacture.

In the month of September following, the Russian artillery tried at Ochta a plate of Creusot nickel steel, one of steel by Vickers of Sheffield and a Brown compound plate. These were classed as a result of the trials in the order named. Each plate sustained the shock of 5 Holtzer chrome steel shell of 41k3, fired from a 15c gun of 35 calibres in length. The first two shots of each series had a velocity of 610 metres, and the three following 640 metres. The compound plate resisted the first two projectiles, which remained lodged in the metal, but the three others perforated it entirely. Three projectiles broke up on the Schneider plate, only one reaching the backing, but the plate suffered much and cracks appeared in all the indentations. The projectiles penetrated deeper into the Vickers plate, but none of them pierced it and only insignificant cracks appeared. (*Mittheilungen über Gegenstände des artillerie und Genie-Wesens, 2c cahier de 1891.*)

Cupolas for the forts on the Meuse:—The Belgian Government has confided the construction of the necessary cupolas for the bridge-heads at Liege and Namur to four foreign manufactories—those of Creusot, Saint-Chamond, Chatillon et Commentry and Gruson, who are associated with certain Belgian houses for the fabrication of special parts. The plans were elaborated by these establishments. A model cupola had been submitted for trial before a commission presided over by Major-General Wauters. The principal conditions required were the following: a dome shaped roof armored with laminated iron 20 centimetres thick; the body of the cupola to be cylindrical; the outer armor to be of chilled cast-iron 32 centimetres thick in the upper part and 24 centimetres thick in the lower; amplitude of pointing in azimuth 360° and in altitude from -3° or -2° to + 25°; the tower and its accessories to be manœuvred by hand.

The 15c guns intended for a portion of the cupolas are Krupp guns 25 calibres in length weighing 3100 kilos. The charge of 9 kilos of prismatic powder impresses upon a projectile of 39 kilos an initial velocity of 470 metres. (In the tests at Creusot they obtained in reality a velocity of 495 metres with a gun constructed by the factory, having the exterior form of the Krupp gun.)

The 12c guns are Belgian, 25 calibres in length, weighing 1425 kilos. The charge, 4k7 of prismatic powder, impresses upon a projectile of 18 kilos an initial velocity of 520 metres.

The Krupp 21c howitzer for this same armament has a length of 11 cali-

bres and weighs 3030 kilos; the charge, 7k250 prismatic powder, gives an initial velocity of 300 metres to a projectile of 91 kilos.

The three French types are based on the employment of carriages permitting a slight recoil, the German type suppresses all recoil.

It has been shown that none of the cupola types present any inconvenience from smoke or noise in the firing chamber.

A test carried out at Creusot against a fragment taken from a plate intended for one of the cupolas in process of erection, gave the following results: five shots were fired at the angles and centre of a square, 0.25m on a side, with a 15c gun throwing a projectile of chilled cast-iron, made by the Chatillon-Commentry works, weighing 39 kilos, the striking velocity of which was 330 metres. The penetration varied from 144 to 150 millimetres, the plate showed no trace of cracks, although the edges of the indentations nearly joined. The projectiles were found intact at the foot of the butt.

A similar test took place at Saint-Jaques (Montluçon) with a fragment of plate manufactured at the Chatillon-Commentry works. They commenced by firing five shots at the angles and centre of a square, 0.25m on a side, with a 95mm Lahitolle gun throwing an ogival headed projectile of chilled cast-iron weighing 11.4k, with a striking velocity of 376 metres. The penetration varied from 110 to 120 millimetres; the diameter of the indentation was 110 millimetres. The plate presented no trace of cracks. One projectile was broken, one split and three remained intact. They afterwards fired two projectiles with a striking velocity of 433 metres; the penetration was 139 millimetres; the diameter of the indentation 115 millimetres with no cracks. An eighth shot was then directed with the same velocity at the indentation made by the seventh shot; the projectile broke up knocking off a little metal at the edge of the dent. This shot produced a bulge of 30 millimetres at the back of the plate in which was a split 200 millimetres in length.

Smokeless powder:—All artillery services are actively occupied either with testing or manufacturing smokeless powder.

The French artillery is the first to replace black powder by the new explosive. But they have turned to account its external rather than its internal ballistic qualities. The determination of the new charges have been worked out so as to maintain the velocities of the black powder, when these can be considerably exceeded without increasing the pressures due to the old propellant. This increase of velocities would bring about, it is true, an increase in the weight of the guns (in order to control recoil), if we wish to preserve the present calibres, or a reduction of the calibres if we do not wish to touch the weights.

Major Allason of the Italian army believes it useless to increase the ranges, since we cannot improve the eyesight of the gunners, and he thinks that we have arrived at the desirable limit in precision of fire because of the irregularity of fuses and the great dispersion of the shell fragments. Nevertheless, private enterprise has entered resolutely upon the path of increase of velocities and the various artillery services must follow without too much delay.

Austro-Hungary has already decided this question, if the statement made

in No. 181 of the *Reichswehr*, 1890, is correct, namely, that in the new edition of the instructions for the one year volunteers of the Imperial army the charge, nearly smokeless, for the 9c. field gun, model 1890 will be fixed at 0.620k, and that this will give a velocity of 480 metres (the velocity is only 448 metres with 1.5k of black powder). However this may be, the war budget contains an item of 6¼ millions of francs for the manufacture of the new powder, the whole expense anticipated for this purpose being 28½ millions. The credit granted for 1891 is intended, among other things, for the construction of a State powder factory at Presburg.

In England the manufacture of smokeless powder began at the Royal Arsenal, but will be transferred to the powder factory at Waltham Abbey. The cordlike appearance which this explosive presents has given it the name cordite. They have already determined the charges necessary for the rapid fire guns up to 15c as well as for the field gun of 7.6c. But it will be some time before the general adoption of this explosive becomes practicable, for the reason that its action under the effect of prolonged and considerable variations of temperature has yet to be determined.

Italy in 1889 adopted the Nobel smokeless powder called ballistite for hand arms. This powder has been tried also for field guns, guns of medium calibre and rapid fire guns, but the experiments have not yet reached a definite conclusion.

The Government has asked the Chamber of Deputies for a credit of three million francs for the construction of a powder factory devoted solely to the manufacture of ballistite.

In Russia they have erected two additions to the powder factory at Ochta, one for the preparation of pyroxylin and the other for the manufacture of smokeless powder.

We recall that the French smokeless powder is pure nitro-cellulose which is prepared according to the process of the engineer Vielle. This consists essentially in dissolving gun-cotton, with a definite proportion of azote, in acetic ether, removing all tendency to decomposition and finally cutting the resulting thin sheets into scales.

Nobel's ballistite is explosive gelatine containing in general as much nitro-glycerine as collodion-cotton (binitro-cellulose). After having effected an intimate but purely mechanical mixture of the two substances, the solution of the cellulose in the nitro-glycerine is obtained at a high temperature. The resulting gelatinous mass is then rolled between hot rollers, worked into homogenous plates of a hornlike appearance and finally cut into cubical grains. Besides its manufacture, which is not exempt from danger, the Nobel powder presents the disadvantage that the nitro-glycerine can exude in a free state. (*Revue de l'Armée Belge*, Vol. III.)

Nobel powder, called smokeless cannon powder, has been the subject of extensive experiments in the Krupp and Gruson factories. These have given essentially the same results.

At Essen the edges of the cubes varied from 1mm to 10mm. For equal velocities, the weights, charges and pressures have been considerably less than with black powder; thus, in the 15c gun of 35 calibres, 13 kilos of prismatic powder gave a velocity of 528 metres and a pressure of 1665 atmos-

spheres, while $7\frac{1}{2}$ kilos of smokeless powder, 10mm size, gave a velocity of 520 metres and a pressure of 1395 atmospheres.

In the trials at Gruson, which were made with cubes of Nobel powder from 1 to 5mm on edge, they obtained results about three times as great per kilometre of weight of charge as those produced by the old powder while keeping the pressures below those of the latter.

The influence of the size of grain is similar to that in black powders. The deflagration produces a light brownish cloud so thin that one can proceed with the pointing immediately after the departure of the shot. Even in a heavy rain this cloud dissipates in less than three seconds. The powder leaves so little residue that the bore remains nearly clean; and the heating of the bore and cartridge-case is remarkably less than with the old powders. (*Revue d'Artillerie*, September, 1890.)

Explosives:—The French artillery have adopted cresylite as well as melinite. Melinite is obtained by the nitric acid of phenol, C_6H_5OH , and cresylite by the nitric acid of cresol, $C_6H_4(CH_3)OH$. The second explosive is as effective as the first and has more stability. Melinite is lemon colored, crystallizes in needles and has a bitter taste.

Austria has adopted ecrasite, concerning the nature of which we have no information. Among some results of experiments which are known we cite the following from the *Reichswehr*:—A brick arch 1 metre thick and 5.80m in length, covered with a cushion of concrete 0.90m thick, the whole covered with 2.50m of earth, was exposed to the fire of the 21c mortar. One shell produced a cavity in the concrete 0.60m long, 0.65m wide and 0.21m deep. Although it did not reach the arch, the shock detached several bricks and would have rendered the occupation of the interior impossible.

The German torpedo shell was at first loaded with gun-cotton prepared as follows:—The gun-cotton containing 25 per cent. in weight of water, was compressed into disks of 10mm. These were plunged into acetic ether and then covered with a film of collodion in order to prevent the evaporation of the water. The intervals between disks, when in the shell, were filled with paraffine containing red lead in order to render the explosion more clearly visible. After solidification the whole forms a mass which resists the shock of discharge. Gun-cotton has been abandoned and replaced by picric acid. This last is trinitro-phenol, $C_6H_2(NO_2)_3OH$, and is obtained by treating phenol with sulphuric and nitric acids. Picric acid forms the fundamental principle of modern explosives for loading projectiles. It is but little hygrometric and does not submit to modifications in the interior of the shell. It is very insensitive to shock, and this necessitates an energetic primer in order to detonate it.

Technology:—Mannesman Process:—By this process they have obtained the transformation of a solid cylindrical bar into a tube. In order to effect this, the bar, brought to a high temperature, is passed between two rollers of peculiar form whose axes are not parallel. The action of the rollers causes a longitudinal opening along the axis of the cylinder. The operation is done at a bright red heat for steel, and dark red for bronze, copper, brass and delta metal. These tubes present greater powers of resis-

tance than those produced by other modes of manufacture, and can be worked, bent or flattened at will.

The process was invented for the purpose of manufacturing rifle barrels. If they cannot yet produce tubes strong enough to be used in the manufacture of guns, they will find a sufficiently extensive field of application in the accessories and certain elements of gun-carriages and ordinary vehicles. The appliances already produced permit us to predict a brilliant future for this process in civil and military industries. (*Revue d'Artillerie*, November, 1890.)

Aluminium bronze:—Aluminium presents remarkable properties but these have only been utilized industrially within the last few years, since which time they have succeeded in producing it cheaply, chiefly by electric processes of which the best known are those of Cowles in the United States and Heroult in France. A kilogramme of aluminium, which cost 200 francs thirty years ago, is worth only 15 francs to-day, and the decrease in price does not seem likely to stop at this point, aluminium being, after sodium and calcium, the substance most widely distributed over the surface of the earth.

Aluminium can render great service in the metallurgy of iron and its derivatives, thanks to its property of decomposing the oxide of iron at a temperature a little under red. Thus if a thousandth part of this metal be placed in a charge of molten steel it purges the steel, renders it fluid and causes it to flow without bubbles or fissures.

But it is through its alloys, principally with copper, that it can have the greatest application. Those bronzes containing 5 to 10% of aluminium are the most used industrially; above 11% they are very brittle, below that percentage the tenacity increases. Relatively, as regards resistance to traction and elongation, aluminium bronze surpasses all other alloys in use, even cast steel. It is inferior to the latter only in regard to its limit of elasticity and then only when it has been cast. By hammering, rolling and pressing when hot, the limit of elasticity can be raised to that of steel. It is harder than ordinary bronze and, at 10%, its hardness is such that it is necessary to introduce it in a special manner at the rolling mill and to work it with steel, tungsten or chrome tools. But what constitutes the great advantage of aluminium bronze is that with an equal power of resistance, it sustains an elongation nearly triple that of steel. It affords therefore greater security against accidental rupture.

Aluminium has not found application in military technique, especially in the manufacture of guns. But it does not appear doubtful that we shall soon see it so employed, for this metal excites the greatest hopes, a proof of which may be found in the following phrase which M. Hanriot has not feared to write in the *Revue Scientifique*:—"The XXth century will perhaps merit being called by posterity the age of aluminium."

Aluminium brass presents equally remarkable qualities. A proportion of from 1 to 3% of aluminium in ordinary zinc brass has in general the same effect as that of 5 to 10% of aluminium in aluminium bronze. With equal power of resistance to traction, aluminium brass, even at 3.3%, is cheaper than aluminium bronze, cannon bronze, ordinary brass, phosphor bronze and even delta metal. With 1% of aluminium, the resistance is at least equal to that of the last named, besides having an elongation $2\frac{1}{2}$ times as great.

A. B.

Military Notes.

THE BERTHIER RIFLE.

IT is not at all improbable that before long the Berthier rifle will be finally approved as the small arm of the French army, and be gradually introduced into the infantry as the Lebel is expended.

Already the French are arming their cavalry with the Berthier carbine, 80,000 of these weapons being in process of manufacture. The cartridges made for the Lebel will be serviceable with the new arm, so that the confusion and danger certain to arise in an action from having two kinds of ammunition will be avoided.

As the Berthier rifle could be easily made to take the English service .303 magazine rifle ammunition, the ballistics in both cases being identical, and it could therefore be tentatively adopted into our own army without at once revolutionizing its armament, it becomes of special interest to consider the merits of the newer weapon.

In the first place, any one inspecting and handling the rifle, as we ourselves have done, cannot but be struck with its extreme simplicity and handiness. Whereas the Lee-Speed has a total of ninety-eight parts, the Berthier has but sixty-three; the number of parts in the breech mechanism in the latter being but eight, as against twenty-three in the former, and having the further advantage of having no screws. The French propose to give the private soldier control of the breech mechanism of this rifle, and as he cannot well injure it we think this would be an advantage, as he could keep it clean and oiled.

On the score of economy the Berthier has much to recommend it, as its trade price is but £4, as against £6 in the case of our magazine rifle.

The Hotchkiss Company have acquired the patent rights of the Berthier rifle everywhere out of France, and the inventor, M. Berthier, is now in the company's employ. This rifle has been shown to numerous officers of foreign armies, and their opinion was quite unanimous in favor of its being the simplest and most suitable for service conditions of any magazine rifle yet introduced.

We are indebted for many of the following particulars to a paper lately communicated to the Royal Artillery Institution by Lieut.-Colonel W. B. Hemans, late R. A.

The rifle has a bolt action, and gives its bullet a muzzle velocity of 2071 feet per second. The breech mechanism is of very simple type, and consists of very few parts, none of which are at all liable to get out of action. The magazine is quite separate from, and not attached to the rifle at all; it is

simply a metal clip, costing to make about a halfpenny, and in it four cartridges are packed, thus forming a package of cartridges. Of such packages the soldier carries as many as may be ordered, each one thus constituting a separate magazine.

To use the magazine it is simply dropped into the breech of the rifle, and the cartridges in it are fed up one by one, as its predecessor is extracted, by means of a spring which forces each cartridge vertically up into the chamber. When the fourth and last cartridge is pushed into the chamber, the magazine falls through automatically, and another can be dropped into its place.

To use the rifle as a single loader, the magazine is not put in, but the single cartridge is simply inserted in its place behind the chamber, the top of the feeding-up spring for the magazine affording ample bearing for the whole length of the cartridge.

For quickness of fire, simplicity, handiness, general efficiency, and compliance of service conditions, the Berthier rifle can challenge a favorable comparison with any magazine rifle in existence.

The following are the particulars of the rifle and cartridge as intended for the French army :

Rifle.....	Calibre.....	0".301
	Diameter to bottom of rifling.....	0".313
	Depth of " ".....	0".006
	Rifling.....	1 turn in 9".45
	Number of grooves.....	4
	The breadth of the grooves is double that of the lands.	
Cartridge	Diameter of bullet.....	0".308
	Length of bullet.....	1".142
	Total weight of cartridge.....	grains 380
	Weight of bullet.....	" 205
	" capped case.....	" 142
	" powder (smokeless) charge.....	" 33

The muzzle velocity of the rifle with 33 grains charge of French smokeless powder is 2071 feet per second, and the pressure in the chamber 14 tons per square inch.

The following are the particulars of the results of some "rough usage" trials:

A cartridge was charged with a small charge of sporting powder, fired, and the bullet jammed about half way up the barrel. It was then attempted to eject the jammed bullet, by firing a cartridge charged with 33 grains of balistite smokeless powder, but without avail. The pressure must have been very great, but the breech mechanism was in no way affected, and the erosion was very trifling. A very slight enlargement of the chamber was observed, but there was not the smallest fissure, and the rifle continued to fire with no interruption after the bullet was forced out.

A rifle was left in mud for some days, the magazine stuffed with dirt and grit, but it was found sufficient to work the elevator for a couple of seconds to throw out the dirt, etc., which fell through the lower opening of the

magazine, when the firing was carried on, and not the least difficulty experienced.

The packet of cartridges were placed in a belt bandolier, when a man firing with the waistbelt on him, succeeded in making a fair target at the rate of twenty-eight shots per minute.

The cartridge bullets are made of hardened lead, surrounded with an envelope of white metal (melchior) 0.02" in thickness. In France, we believe, it is intended that the soldier should carry 100 rounds of ammunition, which, including the packet magazines, will weight about 6 lbs.

At a recent trial of the rifle the following were its performances:

Mean muzzle velocity, 2071, f.s.

Pressure in powder chamber, 14 tons per square inch.

Penetration of elm at 60 yards, 25 inches.

Penetration of mild steel plate (portion of machine gun shield) 7/32 inches at 150 yards from the muzzle.

Correct targets were made at the following ranges:

200 yards	0°	elevation.
500 "	40'	"
1000 "	1° 30'	"

A skilled soldier or marksman can easily, making a target, expend seven magazines, or twenty-eight rounds within the minute.

For serviceability, simplicity, and capability to withstand rough usage, the Berthier rifle will compare most favorably with the English magazine rifle; and, so far as we can see, there is every reason why the former should have an exhaustive trial in our own services. It could well be introduced in the first instance into the Navy or Indian Army. If our authorities are still wedded to the idea of having a magazine carrying a large number of cartridges, and intended to be only used at the last moment, we understand that the Berthier rifle could be constructed so as to admit of a magazine containing any number of cartridges up to twelve. With a rifle, however, capable of discharging twenty-eight aimed shots a minute, this hardly seems necessary.

We believe that an early pattern of the rifle was tested at Enfield some months ago with good results, and that improvements have been made in the rifle since which meet all objections.—*United Service Gazette*.

INSPECTION REPORT BY MAJOR-GENERAL KEITH FRASER, INSPECTOR-GENERAL OF CAVALRY. (BRITISH.)

In memoranda attached to the report, General Fraser briefly summarizes tactical principles as follows:

1. It is an essential principle to be observed that squadrons should as little as possible be separated from the main body, the dominant idea being that forces superior to those of the enemy must be brought to bear at decisive moments. The success of cavalry resting equally on the swiftness of its action, its dispersion is so much the more dangerous because the bringing together again of its units is even more difficult, owing to its mobility. The combat develops itself so quickly that concentration must be the rule, with-

out which supports, reserves, etc., can never be made use of in time. It is not only in view of a decisive action, but under all circumstances, that dispersions must be avoided. The service of security must be carried out on the principle, and as few men as possible must be detached, so as to retain as many as possible for fighting purposes. 2. Horse artillery and cavalry.—When the nature of the ground admits of a favorable position for the horse artillery batteries, whilst allowing the cavalry to move with facility, that position should become the pivot for the turning movement of the cavalry. The artillery then has time to bring its fire to bear most efficiently, its teams are resting, and its fire can be prolonged on account of the space which the cavalry is gaining towards a flank. The artillery thus protects the inner flank of its own cavalry, whilst the hostile cavalry, in order to meet the attack, is drawn into a direction which exposes it to the fire of the guns which enfilade it. 3. Commanders of lines choose the best mode of carrying out orders received; no detailed instructions are necessary. 4. The shock of a charge must always come from a different direction to the original. Manœuvring is a necessity. No manœuvring of a body above the size of two squadrons should take place within 500 yards of an enemy. 5. It must be a fixed principle that a plain parallel-fronted attack, executed by merely riding straight forward at the enemy, must never take place. Every leader must acquire this habit of manœuvring (otherwise he is useless) against the flanks of the enemy. Squadrons can ride straight at the enemy without help; no science is required for that. 6. The sending out of combat patrols under an officer towards the exposed or threatened front must never be neglected. Each line should send out a complete patrol to guard its flank from surprises. 7. Troops assembled for manœuvre should invariably protect themselves by vedettes placed not more than 500 yards off to the front flanks and rear. These vedettes should be double to allow of their dismounting alternately. 8. Trumpeters should never be sent on messages or out of hearing of the commander. They must keep the mouths of their bugles well up. They should turn the bells of them towards the squadrons to which they are sounding, and not away from them. 9. Men should be practised at galloping through woods in extended order, and rallying; a trumpeter (sounding variations in pace, etc., occasionally) will show where the leader is, and a general alignment can thus be kept up. 10. Every commander from a troop to a brigade of cavalry should be so far from his command as to take it in with his eyes without turning his horse or his head when facing it. 11. Reconnoitring duties at manœuvres must be performed at the walk or trot, not at the gallop. 12. The front of squadrons must be divisible by four; each four of the front rank with its coverers (or blank-files) becomes a group. A patrol should consist of a group, which should detach two or three men as points, singly. 13. The rear of a column must move up the same moment as the front, at the word or sound. "The tail should push the head," apparently. In passing defiles without lengthening the column, see rules for riding in "*Rudel*." A column should be able to pass over a bridge or through a defile half its own breadth without lengthening out at all. 14. The words, "The line will attack," should be given before a charge. The point to lead on must be given to the

leader of direction by the regimental commander in a loud voice. Slight changes of direction of a line should be carried out without word of command up to one-sixteenth of a circle. 15. Cavalry must never retire at a gallop. Changes of formation to the rear from line to squadron columns or other formations must always take place at a walk or trot, never at a gallop. 16. Officers must guide their men with their swords. 17. If other things are equal, superiority in the number of squadrons in first line must be considered by umpires as decisive of success. 18. Cavalry attacks in line, but manœuvres in column; it is a mistake to deploy into line too soon. "Weigh everything in column, risk everything in line." A commander should always try and attack the enemy's cavalry on the left or bridle hand. 19. Men should, if possible, ride in the same place, and certainly in the same group daily. 20. One or two groups of a squadron are generally sufficient to send with guns if a special escort is not required. 21. On dismounted service, officers must always dismount; if not done in peace it will look bad in war. 22. Instead of forming line to the front from squadron columns, which necessitates a reduction of pace of the body, it is generally preferable to change the direction of heads of squadrons and then to wheel into line, which means the same rate of march may be maintained. "Front form" is generally badly done; "wheel into line" is usually well done. And he also gives an explanation of "Rudel," or proposed system of passing defiles, bridges, etc., by bodies of cavalry. The possibility of being able quickly to debouch from a defile and to reform for attack in any direction is one of the utmost importance for cavalry. The present system as laid down in the regulations of to-day for diminishing the front by breaking off into fours, sections, etc., from a flank, is always the cause of delay and lengthening of the column, as well as of necessitating the debouching in a faulty and complicated formation should the enemy be on the reverse flank of the column. It is an important matter that, immediately after debouching, any kind of formation should quickly be taken up. With this object the so-called Rudel was first adopted in the Austro-Hungarian cavalry, and has now been introduced into that of almost all Continental armies. The following is the system of instruction in this formation in force in Austro-Hungary: When a Zug, *i. e.*, the fourth of a squadron (about 12 file), arrives at a defile or bridge so narrow as to prevent any further advance at the Zug's own breadth, for the purpose of instruction six or seven paces is a suitable breadth. At the command "Rudel," the non-commissioned officers on the flank of the front rank come up into alignment with the commander of the Zug, riding as close as they can to the sides of the defile. The men between these and the officer squeeze in between the flank non-commissioned officer and the commander; the centre man continues to ride behind the commander; the rear rank do the same thing, riding as close as possible; the whole must ride in a thickly crowded knot, keeping exactly the same pace as before. The rear-rank men must not push on among the front-rank men, nor must the commander slacken his pace on arriving at a defile, but ride straight into it, and when his Zug is through it he reforms it in order, by the word "In der Zug" (or in troop). The same principle is adopted in a column, however long, which should be able to pass a defile half the breadth of the lead-

ing body without diminishing its front, and without the slightest increase of pace being necessitated in the rest of the column after debouching. The commander riding with the men of the front rank close to either side of him still directs them, neither he nor his centre man, nor the centre man of the rear rank, making the slightest alteration in their pace or relative positions. The Rudel is also most useful in riding over very broken ground, through plantations etc., where men have to find their own way.—*Army and Navy Gazette*.

THE ARTILLERY OF THE FUTURE AND THE NEW POWDER.*

In this little volume the author, Mr. James Atkinson Longridge, continues his investigations of the action of smokeless powders with reference to the ballistic effects obtainable and the pressures within the gun. The work itself is unfortunately too technical for the general reader, but the broad outline of the method of calculation pursued is simple, and can be easily grasped, while the conclusions arrived at should be of the greatest possible national interest. By calculations analogous to those in his "Internal Ballistics" and in a pamphlet on "Smokeless Powders," published last year, calculations published on the researches of Mons. Sarrau and tested by the results of experimental firing with Nobel's smokeless powder, at Essen and Meppen in 1889 and 1890, he obtains what may be called, and what is in fact, an indicator diagram showing the pressure at every point within the gun, and the work done upon the shot in the same way as the ordinary indicator diagram exhibits the pressure in the cylinder of a steam engine and the work done upon the piston.

From such a diagram the velocity and penetration of the the projectile can be easily calculated, the stresses on the gun observed, and the effects of variation of capacity of chamber, gravimetric density of charge, and length of chase made clear.

The most striking characteristic of the new powders, Nobel's, the French B N, and the English cordite, is their enormously superior force from $2\frac{1}{2}$ to 4 times that of the E X E and brown prismatic service powders. To utilize this force in the attainment of higher velocities and greater penetration, in increasing, in fact, the energy development per ton weight of gun, two plans may be adopted. Either the capacity of the chamber may be reduced and the initial pressure upon the shot increased, or the present maximum regulation pressure may be maintained further along the gun. By no other method can the mean pressure on the shot, or the energy developed per ton weight of gun, be increased.

Unfortunately neither alternative is applicable to the present service guns, for they have not sufficient strength to bear either increased initial pressures on the breech ends and in the chambers, or the continuance of the present initial pressures further along the chases.

Thus Mr. Longridge comes to the conclusion that no material increase of ballistic effect can be got from the present new type steel guns without considerable risk, and that to reap the full advantage of the characteristic

* By James Atkinson Longridge. London and New York: E. and F. N. Spon.

qualities of the new powders, it will be necessary to enter upon a fresh reconstruction of our ordnance.

The fundamental principle which he insists on as the basis of such reconstruction, is the adoption of a high initial pressure, such as 30 tons, instead of the present regulation maximum of $17\frac{1}{2}$ tons, and to illustrate the importance of this principle he goes into numerical calculations, which, if correct, are incontestible evidence in favor of his views. For instance, he compares the present 12-in. Woolwich gun Mark V. firing a projectile of 714 lbs. with 295 lbs. of brown prismatic or E X E powder, with a new high-pressure gun of the same length and weight, firing a 900-lb. projectile with 200 lbs. of Nobel powder, and shows that while the first is able to penetrate 22.5 in. of iron at the muzzle or 20.6 in. at 1000 yards, the latter would penetrate 34 in. at muzzle and 31.4 in. at 1000 yards. If, however, the Woolwich gun, which is 27 ft. $4\frac{1}{2}$ in. long, were fired with a 900 lb. shot and 148.7 lbs. of Nobel powder with an initial pressure of $17\frac{1}{2}$ tons, the penetration at 1000 yards would be 25.6 in., but the pressure in the chase would be greater than the gun could safely bear. On the other hand, a new gun only 20 ft. in length firing the same weight of charge and shot, but working with an initial pressure of 29.65 tons, would pierce 30.7 in. of iron at the same distance.

Nor is this the limit of the advantage to be gained, for if, as Mr. Longridge asserts, an $8\frac{1}{4}$ -in. gun can be constructed to pierce 27.78 in. of iron, thus giving a power of penetration 12 per cent. greater than the present 12 in. Woolwich gun of 47 tons, and only 10 per cent. less than the 13.5 in. gun of 67 tons, it is clear that such unwieldy monsters as the 110-ton guns, and even the 67-ton guns, may be abolished in the naval service.

These are results which we think will startle the advocates of low pressures, for it is beyond question that if such guns as Mr. Longridge advocates can be produced, the nation which first adopts them will confer upon its navy an advantage equal to that bestowed upon the Prussians by the needle-gun in 1866.

The question is, "Is Mr. Longridge right, are his formulæ correct, or even approximately correct?" As regards the Nobel powders they have been compared and found to agree with experimental results of no less than 468 rounds fired from sixteen different guns, varying in calibre from 1.97 in. to 8.24 in. with projectiles varying from 3.85 lbs. to 308.9 lbs. and charges from 0.35 lb. to 48.5 lbs., composed of grains ranging from .0395 in. to 0.393 in. in thickness. As regards the French B N powder and the English cordite, the author himself admits that the experimental facts in his possession are too few to form the basis of an independent investigation; but as the main ingredients are probably closely allied to those of Nobel's powder and the circumstances and results of combustion, so far as he has been able to ascertain, are of a similar character, there can be little doubt that the application of his formulæ to these powders will give results approximating nearly to the actual facts. If so they give cause for serious reflection. Mr. Longridge is no visionary enthusiast. His conclusions are the result of exact and careful calculation, and so far as the questions at issue between

him and the ordnance authorities have been submitted to the test of practical experience, he has been proved in the right.

His plan of strengthening guns with wire has proved so far a practical success that sixty of such guns are now being made at Woolwich. The method he has advocated of securing longitudinal strength by fastening the breech plug to the outer jacket, instead of to the inner tube, has lately been adopted. If, then, two of the three great principles he has laid down have, in spite of years of opposition, forced themselves into acceptance, it is surely time that the third, namely high initial pressure, was brought to the test of practical experiment, and that his coöperation should be secured in carrying out the work. For thirty years he has advocated these principles with a persistency worthy of better treatment than he has received, and even now when the correctness of his views is beginning in some sort to be recognized, he is not even paid the compliment of being consulted by those who are making use of the fruits of his labor. Truly this is hard to comprehend.—*Engineering*.

Reviews and Exchanges.

The Franco-German War. Von Moltke, 1892.*

FOR a history of grim visaged war this is a charming and instructive book. The story is so modestly told that the reader scarcely believes that the author could have been the man who directed the movements which he describes. The great soldier has been able to set aside all professional technicalities, and tells the story which he knows so well, as if he had been only a spectator of the events. Scrupulously correct in his facts; clear and concise in his language; generous and just in his distribution of praise to friend and foe alike; he paints a picture of the great struggle which so captivates the imagination that one almost believes after reading it that he has been there himself. The chain of events which the author unrolls is as fascinating as a panorama. Not only do the features of every battle-field stand out in bold relief, but the personalities of the principal actors—with one solitary exception—seem to start out of the pages as you read. No matter how much you have previously read on the subject; no matter how familiar you are with all its details; you will be ready to admit after having read this volume, that you have clearer conceptions on the subject than you had before.

The translators seem to have done their work fairly well. We have not the original work by us to refer to, and therefore would not speak positively; but we hardly think that the author could have described the 200 guns which constituted the siege train at Strasburg as "Field Pieces," (p. 133) especially as he speaks of them on the next page as "guns of the heaviest calibre." There are several similar slips which will be apparent to the professional eye, but they are not sufficiently numerous to injure the narrative or obscure the facts. They are too palpable to mislead.

Before proceeding to consider the work in detail, it may not be out of place to refer to one feature which can be traced in almost every action, and is always brought forward by the author in such a way as to redound to the credit of the actors. We refer to the spontaneity of action so characteristic of German generals. The reader forgets for the moment that there was a master mind directing every movement and providing for every possibility. It is permitted to assume that the German corps were drifting through France in search of adventures, like the knight errants of old, and were guided into accidental conflicts with the enemy, by the sound of cannon alone. But there was too much method in their madness for that. They were always in the neighborhood when they were wanted and so arranged that their spontaneous concentrations were accomplished without confusion, without detriment to the general plan, and always in the nick of time. Now, if this had occurred but once, it might be chance; if twice, it might be called miraculous; but when it happened almost every time the mind demands a natural cause for it.

No commander can tell with certainty what the kaleidoscope of war will disclose

* *The Franco-German War, 1870-71.* By Field Marshal Count Helmuth von Moltke. Harper & Brothers, Franklin Square, New York, 1892.

to-morrow. If he could his orders would be positive and strict obedience would be insisted on. The majority of commanders, perhaps, assume that they can, and act accordingly; but there are exceptions. There are commanders who condescend to deal with probabilities, and the probabilities in any given case are always numerous. The commander who can discern all the probabilities, and so arrange his troops that they will be able to act effectively with the least possible delay, whichever probability turns up the certainty, is the great commander. And this we conceive to be von Moltke's case.

With such an arrangement of troops, spontaneous concentrations become, not only possible, but advisable. The sound of conflict is the order for concentration to every commander within supporting distance. Von Moltke does not disclose, in this work or in any other as far as we know, what he deemed probable disclosures of the kaleidoscope in any case. Indeed, he is too modest even to mention that he had reached any conclusions on the subject. He points with pride to the spontaneity of action of subordinate commanders and is willing that the reader should believe that there was nothing more in it. No doubt many readers and perhaps some commanders will so believe. Perhaps liberty of action without well studied arrangements may be permitted in future campaigns. To copy masters without comprehending them, is one of the great military weaknesses of the day. Indeed it has always been a weakness. But copyists must beware. Real art cannot be copied, and even real artists cannot explain why.

The man who cares nothing for popularity is free to state the truth as he sees it. He will not condescend to sugar coat his wisdom to please the popular taste. Popularity is one of the idols of the nineteenth century, but he is not one of its worshippers. Now, it has long been a popular belief that wars are the result of monarchical ambitions, and the belief had a solid foundation of fact at one time. But democratic ascendancy has changed all that. The people, or what amounts to the same thing, their representatives are the real war making power, and it is very generally believed that this is a great safeguard against unnecessary war. Our author believes the opposite. He says "That a declaration of war is more easily carried by a large assembly than by a single man." (p. 1.) And we believe his assertion is strictly true. Popular passions inflamed by a press responsible to no one, are more fruitful sources of unnecessary war than the veriest despot that ever governed a nation. The multitude knows nothing of responsibility and cannot be cautious. The monarch can divide his responsibility with no one, and possible consequences make him cautious whether he likes it or not.

It is pitiful to see a government driven into disastrous and unnecessary war by popular clamor, even although it richly deserves it. The rulers of France had flattered the nation into the belief that it had no military peer, and the mere suspicion that a rival existed was more than it could stand. War was demanded by the nation and Napoleon III. was not strong enough to resist the demand. He was not ignorant of the gravity of the undertaking. He may have hoped for a divided Germany, but the hope rested on no sure foundation. Prudence might have demanded assurances on that point, but prudence and popular clamor are incompatible. The nation was drunk with anticipated success. Paris was in a ferment. Symptoms of the insanity of 1798 appeared, and war was an immediate necessity.

History has laid the war of 1870-71 at the door of Napoleon III. Even his adversary announced that he fought against the Emperor only. He had no quarrel with France. But France and not Napoleon III. had a quarrel with Prussia. The declaration of war was in no way dependent on King William's views. "Revenge for Sadowa" demanded the declaration and neither William nor Napoleon could prevent it.

Louis Napoleon was too keen an observer to be fooled with the fustian of the French press or the bombastic declarations of his own ministers. The Mexican failure was too green to be forgotten. He knew that his army was in no condition to march immediately on Berlin. If he did not he had a rude awakening on his arrival at Metz. The "*archifret*" army was not ready to advance. The "Marshals declared that the condition of the troops made that impossible." (p. 5.)

What a contrast between the condition of affairs and the preparedness of Prussia. There everything had been anticipated. Diplomacy had done its work. The armies of Germany were united; mobilization was already planned and every soldier knew when to start and where to go. His transportation was ready and refreshments for his journey had been ordered in advance. The result was that "when his Majesty arrived in Mayence a fortnight after the declaration of war" he found 300,000 men assembled on and in front of the Rhine and ready for action. (p. 8.)

But campaigns cannot be planned in advance. After contact with the enemy everything depends on circumstances. In this case "the advance to the frontiers alone were prescribed," or, as the translator has it, "preordained." (p. 8.) We learn, however, that von Moltke "had his eye fixed from the first upon the capture of the enemy's capital." (p. 8.)

The original plan of the Emperor, and perhaps the thing to be most dreaded by the Germans in the early stages of the campaign, was the invasion of the Black Forest region by the corps assembled at Belfort and Strasburg. To guard against such an event a sufficient number of troops might have been detached to oppose the crossing of the river. But that was not the proper way to counter the possibility, nor was it von Moltke's way. It accomplished his purpose and effectually prevented invasion by "setting the third army moving at the earliest opportunity." (p. 10.) The presence of a German army on the left bank of the Rhine and south of the Lauter closed the passes of the Black Forest against the French.

The affair at Saarbrücken receives and deserves but slight notice; but the confusion and hesitation of the French commanders immediately after that insignificant affair teach a lesson which should not be overlooked. A general without reliable information as to the whereabouts of his adversary, is like a man playing blind-man's-buff. Rumor is always a romancer, and the man who earns his living by risking his neck, if he does not manufacture his reports out of whole cloth, shades his facts so heavily with imagination as to distort them out of all semblance to truth. The only way to obtain reliable information about an enemy is to squeeze it out of him by actual contact.

The author says want of information "induced the French leaders to divide their forces into two distinct armies." (p. 11.) And that may be true. Still it does not distinctly appear how the division could have been avoided under the circumstances. Mobilized for a purpose which could not be carried out, the French corps were not conveniently situated for rapid concentration into one army, and very naturally drifted into two. No doubt if they had known in time that all the German armies would be assembled on the northeastern frontier, other arrangements would have been made, and that, perhaps, is the "information" to which the author refers. But it is never easy to ascertain positively what is going on behind an enemy's frontier.

The battle of Weissenburg is disposed of in a few paragraphs. The immense numerical superiority of the Germans put the result of that action beyond doubt from the beginning. But the French made a gallant fight of it, and ultimately got away, although in great disorder. That they effected a retreat at all, after such an obstinate and unequal struggle, almost entitles them to claim a victory.

War is such an uncertain business that no rigid rules can be laid down for its man-

agement. The independent action of subordinate commanders so generally practised in the German armies, when indulged in without the necessary preparation, sometimes led to unpleasant results. At the battle of Wörth this was specially observable. The Crown Prince had learned by experience at Weissenburg the unwisdom of fighting even a successful battle without proper preparation. At that battle his cavalry had been delayed on the march, and had not reached the battle-field even at the close of the action. The consequence was that he lost touch with the defeated enemy. No doubt he determined that such a thing should not occur again, but it did. The impetuosity of his corps commanders, and the liberty of independent action allowed them by custom, brought on the battle of Wörth against his express commands one day sooner than he intended, and again his cavalry were not on hand, and contact with the defeated army was lost.

But the battle of Spicheren is, perhaps, the best example of this German method, General von Kameke arrived in front of the position supposed to be occupied by the enemy, and found that they were gone. He at once occupied the position and was fired upon from the heights of Spicheren. He had only one brigade with him, and had no certain knowledge as to the exact position of his nearest supports. But he attacked without hesitation, knowing that by that very act he assumed control of all the German troops within hearing of his cannon. And there happened to be quite a number. Von Zastrow, von Alvensleben, von Goeben, von Döring and von Barnekow, without waiting for orders and without any concerted action or even knowledge of each other's movements, all headed their commands towards Spicheren.

The battle of Spicheren baffles description. The brigade first on the ground attacked at once without waiting for anybody or ascertaining the strength and position of the enemy. Of course, it was repulsed. But another brigade arrived just in time to save the first one from utter destruction, and the two got inextricably mixed up. Other brigades arrived from time to time and kept the battle going. Commanders changed almost every hour, if not oftener, by the arrival of senior officers on the field. Often on the very verge of disaster the army was always saved from destruction by the timely arrival of a fresh brigade, and at the close of a day of desperate fighting it found itself in possession of the field. The French withdrew under cover of darkness. Now that was a grand struggle, but it can hardly be called systematic war. Spicheren was a contest in killing, a grand display of personal pluck. But the student of war will find little art in it, and it may help to make him a military skeptic.

There is nothing more apparent in von Moltke's very clear and temperate description of the campaign thus far, than the utter failure of the cavalry with the third German army to properly perform its functions. It would be unsafe to say that the fault was entirely with the cavalry. We have already hinted at another cause. Then circumstances may have made the cavalry rôle exceedingly difficult. We do not pretend to account for the failure, but the failure existed. We read "the generals of the Third German Army did not know of the disorderly condition of the defeated enemy, nor even the direction of his retreat," after the battle of Wörth. (p. 28.) And when we remember that there was similar uncertainty after the battle of Weissenburg, we are forced to believe that there was something wrong. The cavalry of the Second Army on the other hand, seem to have done excellent service. "They fought close up to Metz," (p. 28) and collected invaluable data everywhere, and Prince Frederick Charles had always something more substantial than rumor to base his movements on.

But the information collected by the cavalry was not disseminated throughout the army, and the opinions based upon it were not universally shared. Many German generals believed, long before there was any evidence to justify it, "that the French

were already in full retreat." (p. 30.) This belief, and the liberty of spontaneous action which the generals enjoyed, seems to have brought on the battle of Colombey-Nouilly. The 2d, 4th and 6th French corps had just begun the retreat, when General von der Goltz, who was doubtless watching for such a movement, threw his corps without any orders, squarely across their path, and the voluntary intervention of neighboring divisions developed the fight thus begun into a great battle, which was actually fought to a successful conclusion without having any one in general command. (p. 33.) But we read (p. 34) that the Commander-in-chief was very well satisfied with the results.

The defeat at Colombey-Nouilly had very serious results so far as the French army of the Rhine was concerned. Indeed it may be said to have sounded its death-knell. If it had been permitted to continue the retreat which von der Goltz so unceremoniously interrupted, there might have been no Gravelotte with all its train of consequences. Not that the loss of time amounted to much, but the defeat so demoralized the army as to make it forget the most essential precautions. We read (p. 35) that the bridge across the Moselle at Novéant "was found intact" by the Germans, and utilized by them in transferring their army to the left bank of that river. And that night their cavalry pushed on to Mars-la-Tour. Of course the whole German army did not cross by that bridge, but if it, and other crossings had been destroyed or guarded, the whole German army would have been delayed, and Mars-la-Tour would have been free from German cavalry for perhaps twenty-four hours longer.

"The generals of the Second Army, like the rest," (p. 35) seem to have expected no more fighting on the Moselle. We italicize the last clause because of its vagueness. Whom the author means by "the rest" is difficult to determine. The movements ordered for the 16th clearly indicate that the same opinions prevailed at General Headquarters. It was believed that Bazaine would retreat, and would lose no time in doing so. That his retreat could be intercepted was hardly hoped for. But he might be compelled to fight faced to a flank, and that idea seems to have prompted the orders for the 16th. But Bazaine had been delayed by a blockade of baggage wagons and the German advance struck the southern road to Verdun at a point in advance of his army.

The fighting at Vionville had all the German characteristics. General von Stülpnagel, finding himself in front of an enemy, which "It would take all his strength to beat, (p. 37) attacked him at once, although he had no immediate supports, and no certain information as to the whereabouts of the nearest troops. But he knew that the sound of his guns would call to his assistance every commander within hearing. And he was not disappointed. General von Buddenbrock was *en route* with his division to Etain to which point he had been ordered. But the moment he heard von Stülpnagel's guns, he abandoned the movement and directed his division on Flavigny. These two divisions were just able to hold their ground until the arrival of a portion of the X Corps which had now been summoned to their assistance in the usual German way.

The problem which now presented itself to Bazaine "If he had been resolved to proceed" as the author naively remarks, (p. 38) could have only one solution, and that was to attack the Germans in his front immediately. That he did not do so can be accounted for, only on the supposition that "Political Reasons" induced him "To attach himself to Metz." (p. 39.)

During the early part of the day the Germans were in an exceedingly critical position at Vionville. At 2 o'clock P. M. the infantry were not only exhausted but almost out of ammunition. "There was not a battalion, not a battery left in reserve all along the exposed line." (p. 40.) It was a grand opportunity for the French, and Canrobert seems to have seen it and made preparations to profit by it. But the heroic

charge of 800 horse carried such consternation into the French ranks, that they were deterred "from further attack on Vionville." (p. 41.)

To say that Canrobert's corps was cowed into inactivity by 800 cavalry would be simply absurd. There was nothing in the material effect produced by that charge to deter his attack for a single moment. But the spirit which carried that charge home, created consternation in the French ranks, and in the heart of the gallant Canrobert himself, and attack became impossible. When the chapter on Psychology comes to be added to the Art of War, the writer will find a convenient illustration in this cavalry charge at Vionville.

But the cavalry charge at Vionville was not the only one that had a deterring effect on the French that day. There was another, somewhat different in its character and magnitude, which the author describes as "The greatest cavalry combat of the war," (pp. 44, 45) fought out on the Heights of Ville sur Yron, and which "had the effect of making the French right wing give up all further attempts to act on the offensive." (p. 46.)

With such examples as these before us it would be exceedingly rash to assert that the usefulness of cavalry on the battle-field was over. In summing up the results of the day's fighting the author says that the Germans were able to hold their ground. But only by most decided counter attacks from the cavalry and the unflinching tenacity of the artillery. (p. 46.)

One of the most unaccountable features of this day's fighting is the order to renew the struggle at 7 P. M. Already the troops had fought for nine solid hours. They had suffered severely and were only just able to hold their ground. The nearest troops which could come to their assistance—the XII Corps—was a full day's march away; their ammunition was all but exhausted, and there seemed to be nothing to gain by renewing the attack. Nevertheless the attack was renewed and continued until ten o'clock. Was this madness? or was it merely intended to conceal the real condition of the troops? If the Germans had remained inactive during the evening the French might have guessed their condition. But the attack dispelled all hopes of German exhaustion, and may be interpreted to mean the close proximity of reinforcements. At any rate an early attack by the French next morning, if it ever was contemplated, was abandoned. This seemingly unaccountable attack may have rested on sound psychological principles.

The king's headquarters were at Pont-a-Mousson during this eventful day, and had no information from the front until about noon. (p. 48.) The fact that Bazaine's retreat had been intercepted must have been a pleasant surprise to von Moltke. He had no doubt expected "like the rest" that he—Bazaine—would be brought to bay, and forced to fight in a disadvantageous position; but that he would be squarely cut off from Verdun was hardly to be hoped for. There was war in the wind however long before the news of actual conflict arrived, and although they heard no cannon, some impatient generals had started for the front and all had made ready to do so, before the orders arrived for them to go. A corps starting for the front without orders, under the very nose of the king, is another illustration of a German general's independence which the average military mind cannot readily assimilate. But they had only anticipated their orders by a few minutes. On to Vionville without a moment's delay was the order of the day. We have seen how sorely reinforcements were needed there at ten o'clock on the night of the 16th. But by 1 P. M. on the 17th, the danger was over, and the III., VII., VIII., IX., X., XII., and Guard Corps were all on the ground or rapidly approaching. The concentration for Gravelotte was made.

Bazaine seems to have been well pleased with his position at Gravelotte. Indeed he thought his line impregnable. (p. 50.) The position was deliberately occupied, very

generally intrenched and manned with from eight to ten men per yard of front. Unfortunately Canrobert's corps was without intrenching tools and therefore unable to intrench.

The French line was formed on the 17th or during the night, but the Germans had to manoeuvre into position on the 18th. The plan of the battle had not been determined on until 2 P. M. on the 17th. (p. 49.) As the corps moved into their assigned positions some delays occurred, and the spontaneous method had some serious consequences. General von Manstein, imagining that he had a grand opportunity for a surprise at Amanvillers, disregarded his orders, attacked and met with a serious repulse, and for a time the German line was in danger of being cut in two. The timely arrival of the III corps restored stability. The fighting was desperate all along the line and on the German left "The losses of the attacking Guards were in fact enormous." (p. 61.) Space will not permit a discussion of the tactics of the battle.

The German armies which fought at Gravelotte numbered 178,818, and the author computes the strength of the French army by taking as a basis the numbers surrendered by Bazaine in October, namely, 173,000 men, and adding to them the losses at Gravelotte. His conclusion is that the French army at Gravelotte numbered at least 180,000 men.

The investment of Metz was effected with an army of 150,000 men—less than the strength of the blockaded army. (p. 65.) There is something about the blockade of Metz and also about that of Paris, which is difficult to account for on military grounds. Of the two, however, Metz is the more inexplicable. At Paris the blockaded army consisted of very inferior troops, but Gravelotte proved that Bazaine commanded an excellent army. Admitting that the German troops were posted so as to facilitate rapid concentration, they would have had their concentration to make after the battle began, and even if they were all concentrated they would be outnumbered. No doubt the spontaneous method found excellent opportunities for application. No time was lost waiting for orders, and the certainty of prompt assistance must have an excellent effect upon the troops first assailed. There is something about this method which deserves to be studied. How far it can be copied with safety is quite another matter. But neither the facilities for concentration, nor the spontaneous method, nor both combined can sufficiently account for the endurance of the blockade.

MacMahon's army at Chalons, like all improvised armies, was simply unmanageable. It is a waste of time to study its movements or to attempt to account for its disasters by strategical or tactical rules. It was merely a multitude of armed men. Good material no doubt, but not an army.

Von Moltke was placed in a very trying position by this erratic army. It was his objective. He expected to come in contact with it at Chalons. Rumor said it had left that place, but von Moltke paid no attention to rumor. Reports from his scouting parties confirmed rumor but could not tell where the army had gone. A telegram from London placed it at Rheims, so did the captured letter of a French officer. Another captured letter said it had gone to Metz. All these and many similar bits of evidence, kept dropping in upon von Moltke, but he kept on his way changing the direction of his advance, but slightly. He held to the rule that in all probability "the enemy will do the right thing" (p. 71), and he would not believe otherwise without positive proof. "Still it was possible," and he prepared his plans, no doubt, to meet the possibility. No better proof of von Moltke's strength of character can be found than his actions from the time that rumor reported that his adversary had not "done the right thing," and the moment that he had positive proof of it. No change of plan, no halting of columns, no hesitation, no doubts. Only a very slight change in direction, and that on positive proof that the camp at Chalons was empty. But when he had positive

proof of MacMahon's whereabouts, and it was apparent that he had not "done the right thing," the counter movements followed at once, and the change of front was executed like a drill manœuvre.

Mac Mahon, as already said, had not "done the right thing." He had marched on Montmedy expecting to find Bazaine there, but found instead positive information that he was still blockaded in Metz. Then he started to "do the right thing." But the Minister of War telegraphed: "If you leave Bazaine in the lurch, revolution will break out." (p. 75.) And so MacMahon turned eastward again, against his own judgment, and plunged into that ocean of difficulties which had no outlet but surrender.

Believers in the invincibility of breech-loading muskets as against cavalry are fond of citing a certain affair at Sedan in which a German skirmish line repulsed a cavalry charge without even closing files or fixing bayonets. But there seems to have been several other affairs at that battle which tell very strongly for the cavalry side of the question. General Marguerite's five regiments of light horse and some lancers charged the 43d German Infantry Brigade over very rough ground, exposed not only to a front fire from the infantry, but a flank fire from artillery and broke through their front lines at several points, being checked only by the reserves. (p. 97.) "And the murderous turmoil lasted for half an hour." To be sure the result was disastrous to the cavalry. The Prussian infantry "lost but few," but the ground was strewn with dead and wounded cavalry. We do not refer to it as a wise performance, but only to show that it can be done.

MacMahon's attempt to raise the siege of Metz must be considered a mad movement altogether, not of MacMahon, but of the Minister of War. If MacMahon had commanded a manageable army and Bazaine had broken out of Metz in a westerly direction, they, no doubt, could have effected a junction about Montmedy. But could they have fought the combined German armies successfully? If they could not they would have been driven over the Belgian frontier. There are altogether too many ifs in the problem.

But Bazaine had not broken out of Metz. He had hardly made a serious attempt to do so. Any serious attempt made during the first week of the blockade "would have met with but slight opposition." (p. 102.) And as the emperor was still emperor in name at least, and a junction with MacMahon was essential to the safety of the capital, not to mention the existence of the empire, a serious attempt ought to have been made. And Bazaine intended to make it. On August 20th he wrote to Chalons: "I will give due notice of my march if I am able to attempt it" (p. 102-103), and later, on the 23d, he reported the direction he should take. On the 26th he made preparations for a sortie, but instead of making it he called a council of war, and specially impressed upon his generals "that the best service they could render to their country was to preserve the army, which would be of the greatest importance if negotiations for peace should be entered into." (p. 104.) And here, we think, is the key to Bazaine's conduct. He recognized that France was defeated. He may have hoped that the emperor would sue for peace, and that the existence of his army, blockaded as it was, might influence the negotiations. We believe that Bazaine was true to the emperor and acted throughout for the best interests of France. We believe that as early as August 26th he had formed the idea of purchasing a peace. Perhaps he expected revolution in Paris, and hoped that his army might be called upon to restore order. At any rate he determined to preserve his army, and the intended sortie ended in a "Parade Manœuvre." The author says on this point "that the Marshal, if his plans had been carried out, would have acted otherwise than in the interest of France is neither proved nor to be assumed." (p. 105.)

Bazaine made one effort to get out, after the fiasco of August 26th, and it is difficult to account for his failure. It was on August 31st and September 1st—simultaneously with the battle of Sedan—and is known as the battle of Noisseville. There 173,000 French troops were repulsed and beaten back into Metz by 36,000 Prussians. Prussian loss, 3400. French loss, 3000. These figures cannot but raise the presumption that the attempt was not made in earnest.

But the disaster at Sedan put a new face on the situation. The Emperor and the army of Chalons were prisoners; the Empress Regent was a fugitive; the established government was upset, and a self-constituted government had come into existence. This last act of the drama was performed on the night of November 4. Bazaine must have heard of it by the 10th. On the 22d we find him collecting "all the provisions to be found in the villages within the line of blockade." (p. 161.) He had determined to wait and watch events. Perhaps he had hoped that the Germans would now open negotiations for peace with him. He was the only representative of the Empire left.

And these views were not so extravagant as they look. In spite of their successes the Germans were sorely pressed to hold their own at this time. There were 40,000 of them on the sick list, and 14 battalions had gone home as guards over the Sedan prisoners. (p. 161.) Of course we do not know how much of this was known to Bazaine, but some of it must have been, and the rest was reasonable. It was easy to believe that peace would be acceptable to the Germans. They had beaten France on her own ground. They had the Emperor a prisoner. They were in a position to make any demand. And no doubt Bazaine wished that they would do so. To save the Empire and restore order in Paris was worth a sacrifice, and we have no doubt Bazaine was ready to make it if the exiled Empress would only consent. But the exiled Empress would not consent. Bazaine's attempt at political negotiations was a failure. His agent, General Boyer, went to Versailles with impossible propositions. They were rejected, (p. 165) and nothing remained for Bazaine but military negotiations with Prince Frederick Charles for the surrender of his army.

People who believe that a fighting man is a soldier, and that a multitude of such men with arms in their hands is an army, should study the history of France under the "Government of National Defense and War." Gambetta's impatient and unmilitary spirit, "with ruthless cruelty," (p. 116) sent army after army of untrained and poorly commanded men into the field, to be mowed down by the trained battalions of the invader, and doubtless thought that he was defending France. Such lunacy is not commendable. War, however methodically waged, is a barbarous business, and hatred makes it horrible. The blowing up of the powder magazine at Laon after the place had surrendered, "if intentionally done," was a dastardly act which only amateur soldiers could have been guilty of. (p. 121.) This and similar acts of barbarism only served to increase the difficulties of the situation for France, and, perhaps, to increase the burden ultimately imposed upon the nation at the treaty of peace. There is every reason to believe that France would have obtained better terms, and escaped much bloodshed and humiliation, if honest efforts in the direction of peace had been made after the disaster at Sedan.

But we have already carried our remarks beyond the usual limit. The character of the war after the fall of Metz is of less importance from a military point of view, and may well be omitted from this review. The fact is, France was defeated when the armies of Sedan and Metz were lost, and any sensible government would have sued for peace.

JAMES CHESTER,
Captain 3d Artillery.

The Year's Naval Progress.*

One of the most useful and valuable of our official publications is the annual volume of *Naval Intelligence*, the tenth number of which has just been distributed. Not only does it contain a vast and well-selected amount of information for our naval officers, but it is full of interest to army officers and civilians. Even officers of foreign navies are said to consult this publication for condensed and recent information relative to their own services, and our young officers are fortunate in having such a compendium of naval intelligence annually laid before them.

In looking over the table of contents one cannot help thinking of the surprise and probable indignation that would be manifested if one of the old salts of the first half of the century could come back and take a survey of modern naval outfits. To find line officers not only studying the much-detested steam machinery, including such unheard of devices as forced draft, liquid fuel and triple expansion, but actually wiring the ships, lighting them and handling the guns by electricity, would call forth expletives more suggestive of brimstone than of smokeless powder.

It would be useless in this place to reproduce the table of contents, and space will not permit even a short notice of each separate article. The book should be read and studied by every one sufficiently interested in such matters to read this review.

It is interesting to note that the ships now building in various countries are almost without exception much lighter, in both armor and armament, than was the rule a few years ago. Decks protected (?) with 1 to 2-inch plates and belts or turrets with 8 to 11 inches of armor are quite common and the indications are strong, that so far as floating armor is concerned the long contest between ordnance and armor has been practically given up by the latter.

A new feature of the publication in question is a list of vessels that have been lost, condemned or otherwise dropped from the navy lists, and from this we learn that within a year England has lost 14, France 21 and the United States 10 besides the *Despatch*. There were only three ships launched during the year and our navy is therefore getting smaller so far as numbers are concerned.

One article naturally calls for a few words of comment, viz.: "The Coast-Defense Systems of Europe." This article taken in connection with a similar one printed in Vol. VII, indicates in a most unmistakable fashion that some of our friends in the navy, having the sea, are ready to assume control of the earth as well. This is not after all such a great addition to their domain as would at first appear, for we were taught in our primary geographies that there are "Three times more water than land," and they would therefore be adding only one third to their present domain.

The argument in favor of the control of sea-coast forts by the navy is chiefly summed up in the statement that Germany and some other countries have recently adopted that policy and still others are talking about it; but granting these premises, would not it be as well for us to wait until some one *actually tries it* in the crucible of war.

The "nut shell" in which our author compressed his proposition is the following statement:

"In studying the question of Coast Defense, the fact is forcibly presented that most foreign governments recognize it to be purely naval, as in all its branches, whatever the geographical conditions, its function is to fight the enemy afloat: not necessarily on the high sea alone, but in all harbors, roadsteads, or other indentations of coast line, the naval element thus constituting the inner as well as the outer line of defense with respect to an attack from the sea." * * *

**The Year's Naval Progress*. Annual of the Office of Naval Intelligence. 1891.

And again in his comments. "If a navy is made thoroughly competent for its work, no other defense for a coast will be called into play; and if it is incompetent no other defense can prevent a disaster to the coast."

"Avast there, shipmet!" If forts are of no use what do you want of them? If consistency is a jewel we have here a whole cabinet of jewelry.

Is it possible that our naval officers are already getting tired of their white squadron and want to come ashore? Has it been discovered that our \$50,000,000 worth of ships already built can be riddled by almost any little rifles that foreign ships carry and that it is desirable to get behind earthen parapets or something that will stop at least part of the enemy's projectiles? Or has the recent experience in Chili suggested that something that can't be sunk or blown up by torpedoes is desirable? Or have our friends noticed that at the present rate of decrease the navy will soon be too small to supply a ship for each admiral?

Our author speaks of the absurdity of landmen going upon the water to plant torpedoes, but would there not be some absurdities on the other horn of the dilemma?

The duties of command and the carrying of orders often require men around forts who can ride a horse. Does he propose to give us the veritable horse-marine? Would the commanding admiral add wheels to his gig or would he follow the example of Admiral G., who is depicted in a history of the "Siege of Washington" as "going to the front" in a landau?

It is not proposed to follow out all the lines of thought suggested by this new amphibian. The argument that because the enemy will be sailors, it requires sailors to fight them, would require that since he comes in ships, we should meet him in ships, or if a man goes gunning for geese he should be a goose himself.

There is a notion abroad that guns ashore are more effective and better protected than guns afloat; what possible object then would there be in placing our guns on ships, which plan could only be safely trusted when we had a fleet stronger than any nation or alliance could send against us. This would not be the case even if we had the three hundred million dollar fleet our Naval Policy Board has estimated for.

It is also urged that army officers cannot properly command forts, because they would not know the enemy when they saw him, and would not know what tricks he would be up to, and a case is cited where the commandants of Italian forts had to employ naval experts to point out the different vessels. So the army also employs hunters and pioneers as guides in overland marches and naval officers employ pilots, but in neither of these cases has it been found necessary to place these "experts" in command.

We believe that when "an opinion as is an opinion" is wanted on shore, plenty of Jack Bunsbys will turn up who will not only recognize every foreign ship that floats, but some that have long since gone to the bottom, and who could, when not otherwise employed, give the Weather Bureau several points on meteorology, as controlled by Mother Cary's chickens.

I trust it may be gathered from what has preceded that if the views herein expressed coincide with those of the Army, the latter is not yet ready to turn the sea-coast forts over to the Navy.

W. R. KING,

Lieut.-Col. Eng.

On the Border With Crook.*

Captain John G. Bourke, 3d U. S. Cavalry, has recently published a most interesting book entitled "On the Border With Crook." The author is well known in literary and scientific circles by his work, "The Snake Dance of the Moquis," and other

* *On the Border With Crook.* By Capt. John G. Bourke. New York: Charles Scribner's Sons.

ethnological researches. The present volume tells the story, in a fascinating way, of many years of frontier service with General Crook—a story that is far less known in the country than it deserves to be.

Captain Bourke himself has a history. He entered the service in the Fifteenth Pennsylvania Cavalry in 1862, and has a medal voted to him by Congress for specific gallant acts at the battle of Stone's River, where he was with General George H. Thomas. Subsequently he went to West Point, having served as a private during the war, and graduated in June, 1869. Assigned to the Third Cavalry, he was ordered to Arizona, and in 1870 was detailed for duty with General Crook, then commanding that department. Here he gathered those lessons of devotion to duty with which General Crook inspired every one with whom he came in contact. Endowed with brilliant talents and devoted to his chief, he saw the salient points of every movement in a then extremely hostile country, and jotted down in his note-books, from which this book is written, all the grave, gay and various incidents which distinguished General Crook's campaigns against the Apaches, and afterward against the hostile Sioux of the North.

He kept voluminous notes during all these years, and from them has written a book of surpassing interest. The events of campaign after campaign are related in witty narrative form, embracing not only pleasant and often ludicrous incidents, but also hardships—cold, hunger and dangers—borne by the troops in these little appreciated Western services. Even the cheap honor of a brevet has as yet been considered too great a reward for them.

Few, except those who followed General Crook in these campaigns, can form any idea of their hardships, and fewer still realize the unwearied devotion displayed by him under the most trying circumstances or his entire disregard of his own personal comfort and the persistence and courage with which he followed out his plans. He cared nothing for personal distinctions, and always seemed the embodiment of duty. He was called a great Indian fighter, but he was the last one to provoke an Indian outbreak and was only satisfied to fight when all means of preserving peace had failed. He had a wonderful faculty for gaining and keeping the confidence of the Indians, and seemed to understand their nature thoroughly.

In all his dealings, whether with the War Department, the settlers on the frontier, or with the Indians, sincerity and honesty were his distinguished traits. What he advised the authorities at Washington to do was always for the best interests of the country. What he promised the Indian was scrupulously performed, whether in the way of reward or punishment. He was full of resources. In the most trying situations, when to those who were nearest him it seemed as though the last card had been turned, he would come up cheerfully with a proposition at once so clear and self-evident as to inspire the most despairing ones with new courage. He seemed to take especial pleasure in trying to impart to young officers some of the enthusiastic devotion to duty which he never forgot himself. He inspired them with confidence in his plans and with a determination to succeed, if success were a human possibility. He scorned luxury in the performance of duty, and made his subordinates feel that to share with him the hardest crust, the longest march, the most burning thirst was a pleasure.

In the Sioux campaign of 1876, so graphically described in this volume, when the entire command was subsisting on worn-out horses, if one of the scouts brought in a deer or antelope, it was immediately sent over to the hospital for the sick and wounded, while the general and his staff satisfied themselves on some portion of the anatomy of an emaciated cavalry horse. No soldier in his command had less to eat than he. Complaints were often heard from others, but he was silent. Yet as to his sick and wounded, no one could have been more thoughtful. The best places in the camp were

selected for them, the largest supply of blankets were at their service, and if any one in the command had procured a bird or beast more attractive than horse-meat, it was inexorably assigned to the hospital.

The general himself was a man of the most simple and abstemious diet. It was rare that he would taste of wine, and the simplest food pleased him best. Often, in the last years of his life, when he was in Omaha and Chicago, where he was invited to innumerable feasts and festivities, he would lament to the writer of this that we could not be at some well-remembered camp in the mountains, with a trout and a slice of venison broiled on the coals for supper, and the sky for a tent. His long companionship with great forests, mountains and rivers made him passionately fond of nature, and many a night the writer of this has lain by his side on what he called a "coyote bed" (made of branches of willow or pine) and listened to his recital of wild adventures in regions which, when he first knew them, were almost an unknown world.

For nearly twenty years, in all his hardest Indian campaigns, from Mexico to the Yellowstone, from lands of sun to lands of snow, Captain Bourke was the general's intimate and trusted friend, and this book, while not a biography, is full of intensely interesting details of one of the most picturesque and heroic of lives. The conditions of Indian warfare, which he had to meet, are not likely to occur again. The vast regions of former hostile occupancy have dwindled into small reservations, and railroads and civilization have marked the Indian for extermination or absorption into the body politic. But this story of the services of General Crook and those who served with him in his campaigns is not likely to be forgotten.

This book is written in a happy vein and the narration of events recorded, while adhering to strict accuracy, is full of vivacity and polish of diction. There is not a dull page in it. Frontier life, in its most picturesque phases, with packers, teamsters, scouts, guides, Indians, and all the incidents of campaigning in a wild and hostile country appear in realistic color.

Outside the main story of General Crook's services, the book will have a permanent interest for its fascinating descriptions of characters and conditions which we shall probably see no more. It should find many readers not only among those who participated in these campaigns and among the people of the West who have benefitted thereby, but also with the general public.

No such entertaining, truthful and picturesque story of frontier life and army service has appeared in many years.

T. H. STANTON, Lieut.-Col., Pay Dep't.

History of a Volunteer Regiment.*

Gouverneur Morris, late U. S. Vols., has written a history of the 6th N. Y. Volunteers,—better known, perhaps, as the "Wilson Zouaves,"—which is an interesting, readable book, from the first word of the introduction to the last word of the concluding résumé.

It is certainly "not written from the ordinary point of view of most similar histories," and this fact constitutes its superiority over the usual regimental history.

Those who served with this organization in the field, and know what an excellent regiment it really was, will take great pleasure in reading the writer's complete refutation of the slanderous stories afloat concerning it at the time of its organization.

W. L. H.

* *The History of a Volunteer Regiment.* By Gouverneur Morris, late U. S. V. Veteran Volunteer Publishing Co. New York.

BOOKS RECEIVED.

- Drill Regulations for Street Riot Duty.* By Brig.-Gen. Albert Ordway, District of Columbia Militia.
- Emploi des Cuirassements Mobiles dans les fortifications sur territoire suisse.* Par le Capitaine Julius Meyer. 1891.
- Personal Recollections of the War of the Rebellion.* Edited by James Grant Wilson. New York. 1891.
- Barracks, Bivouacs and Battles.* By Archibald Forbes, LL. D. London. 1891.
- Instructions for Courts-Martial.* By Lieut. Arthur Murray, First Artillery, U. S. A.
- The Franco-German War.* By Count Helmuth von Moltke. Harper & Bros., New York.
- The National Guard in Service.* Edited by Brig.-Gen. Albert Ordway, Washington, D. C.
- On the Border with Crook.* By Capt. John G. Bourke, 3d U. S. Cavalry. Charles Scribner's Sons, New York.
- Die Armee der Vereinigten Staaten von Nord-Amerika.* Bearbeitet von Arthur L. Bresler, Oberst und Commandeur der Ohio Militär-Akademie. Leipzig.

EXCHANGES.

ARTICLES OF MORE OR LESS MILITARY INTEREST.

ARGENTINE REPUBLIC.

Boletin del Centro Naval. July and August, 1891.

BELGIUM

La Belgique Militaire. Fabrication of War Material. Organization on a War Footing. Our New Rifles. Strategic Railways. The Cavalry Saddle. The Army and the Fortifications of Belgium.

ENGLAND.

Proceedings of the Royal Artillery Institution. (October, 1891) Skill-at-Arms. Berthier Rifle. Miranzai Expeditions. Indirect Laying with the Watkin Range-Finder. (November) Ranging a Battery. The World's War Ships from a Gunner's Point of View.

Journal of the Royal United Service Institution. (Vol. 35, No. 164) The Re-establishment of a Separate Navigating Line in the Royal Navy. The Military Resources of the Island of Jersey. The History of Volunteering in India. The French Naval Manœuvres of 1891. The French Staff. (No. 165) The Feeding of Seamen and Marines on Board H. M. Ships and those in the Navy of the United States. On the Entry and Training of the Naval Executive. Magazine Rifles in War. "That the Re-establishment of a Separate Navigating Line in the Navy is Unnecessary."

Aldershot Military Society. Saddles and Saddlery—Bits and Biting.

FRANCE.

Revue Militaire de L'Etranger. (October) Modification in the Organic Laws of the

Italian Army. Velocipede Service in Foreign Armies. The Grand Manœuvres of the Austro-Hungarian Army. Officers' Schools in Holland.

Revue du Cercle Militaire. The Independent Cavalry Divisions at the Army Manœuvres in 1891. The Velocipede from the Tactical and Strategical Point of View. Notes on the Chinese Army. Active Defense of an Isolated Fort.

ITALY.

Revista di Artiglieria e Genio. A Method of Perfecting both Field and Siege Artillery. On the Strength of Plates when Acted Upon by Normal Forces, and when Supported Wholly or in Part. On Certain Materials purchased Abroad for Use in our Foundries. The Evolution of Field Artillery. The Quartering of Troops. Machiavelli and Fire-arms—T. C. P.

NEW SOUTH WALES.

United Service Institution of New South Wales. The Organization and Equipment of Harbor Defenses. Ambulance Organization, Equipment and Transport for the Mounted Services.

SPAIN.

Memorial de Artilleria. (October) Our Army in Oceanica. Application of Electricity to Artillery. Modern Fire Arms. Photo-Electric Apparatus. A New Rifle.

UNITED STATES.

The Century. (November, 1891) Southern Womanhood as Affected by the War. Mazzini's Letters to an English Family. James Russell Lowell. The Major's Appointment. The Food Supply of the Future. San Francisco Vigilance Committees. (December) Queen Elizabeth. The Christmas Shadrach. The Nau-lahka. The Two Lessons. The Long Ago. The Ocean from Real Life. Sherman and the San Francisco Vigilantes.

Harper's Magazine. (November, 1891) Cairo in 1890. Stonewall Jackson. Letters of Charles Dickens to Wilkie Collins. Africa and the European Powers. (December) Chartering a Nation. My Cousin the Colonel. Mental Telegraphy. Measure for Measure. A Faded Scapular. A Walk in Tudor London.

Outing. (November, 1891) The National Guard of California. With the Humboldt Trappers. Saddle and Sentiment. Football in 1891. Horseback Sketches. (December) Cowboy Life. Canoeing on the Flathead. Horseback Sketches. Saddle and Sentiment. The National Guard of California. Hary's Career at Yale.

The Popular Science Monthly. (November, 1891) The Manufacture of Steel. Do We Teach Geology? Lessons from the Census. The Origin of Painting. High Life. (December) Type-Casting Machines. Breathe Pure Air. The Lost Volcanoes of Connecticut. The Training of Dogs.

Proceedings of the United States Naval Institute. (Vol. 17, No. 4) Instructions for Infantry and Artillery, U. S. Navy.

Transactions of the American Society of Civil Engineers. (September, 1891.)

Transactions of the American Society of Civil Engineers. (August, 1891.)

Bulletin of the American Geographical Society. (September, 1891) Native Copper of Michigan. Markham's Life of Sir John Franklin. A. Garcia Cubas on Mexico. The Colorado Desert and Its Recent Flooding. Report of Explorations in Northern Mexico.

The North American Review. (November, 1891) A Plea for Free Silver. The Lack of Good Servants. What Americans can do for Russia. Our Business Prospects. Russian Barbarities and their Apologist.

The United Service. (November, 1891) Our Cavalry in Mexico. The Effect of Smokeless Powder on the Wars of the Future. History of the United States Frigate Constitution. Conquering the North Pole. (December) Education in the Army. Marshal Augereau. Personal Recollections of Sheridan's Raid. An Omitted Napoleonic Chapter. The Night Express.

The Railroad and Engineering Magazine. (November, 1891) English and American Locomotives. A Suggestion for Coast Defense. The Grayden Dynamite Gun. The United States Navy. Foreign Naval Notes. (December) Recent Armor Tests. Trial of the Cincinnati. The United States Navy. English and American Locomotives. The Bordentown Monument.

Annual Report of the Secretary of War for 1891.

Monthly Weather Review (To date).

Army and Navy Register (To date).

Philadelphia Weekly Times (To date).

Home and Country (To date).

Kansas City Times (To date).

Table Talk (To date).

The Electrical World (To date).

The New York Critic (To date).

Pharmacology of the Newer Materia Medica (To date).

Johns Hopkins University Publications (To date).

The 7th Regiment Gazette (To date).

St. Nicholas (To date).

ARTICLES ACCEPTED FOR THE JOURNAL.

The Military Geography of Canada, By LIEUT. A. L. WAGNER, 6th U. S. Infantry.
Diseases which have been Epidemic in Armies, - By MAJOR C. K. WINNE,

Medical Dep't U. S. Army.

Was Gettysburg the Decisive Battle of the War? By COLONEL T. M. ANDERSON,
 14th U. S. Infantry.

LIST OF MEMBERS AND ASSOCIATE MEMBERS

WHO HAVE JOINED THE INSTITUTION SINCE JULY 1, 1890.

Corrected to include December 15, 1891.

Should there be any error or omission in this list, it is particularly requested that notice thereof may be sent to the Secretary.

MEMBERS.

Bainbridge, Aug. H., capt. 14 inf.	Fuger, F. W., 2 lt. 13 inf.
Barnum, Malvern H., 2 lt. 3 cav.	Fuller, Ezra B., 1 lt. 7 cav.
Barry, Thos. H., capt. 1 inf.	Gilbreath, Erasmus C., capt. 11 inf.
Barton, F. A., 2 lt. 24 inf.	Glassford, Wm. A., 1 lt. sig. corps.
Beach, Francis H., 2 lt. 6 cav.	Glassgow, W. J., 2 lt. 1 cav.
Beach, Wm. D., 1 lt. 3 cav.	Grumley, Edward I., 1 lt. 17 inf.
Beall, Fielder M. M., 1 lt. 18 inf.	Hardie, Francis H., capt. 3 cav.
Bennett, Wm. C., 2 lt. 6 inf.	Hasbrouck, Alfred, Jr., 1 lt. 14 inf.
Bishop, John S., capt. 13 inf.	Hatfield, Chas. A. P., capt. 4 cav.
Boyle, Wm. H., capt. 21 inf.	Hawthorne, Harry L., 1 lt. 4 art.
Brady, Geo. K., lt.-col. 17 inf.	Heavy, J. W., 2 lt. 5 inf.
Brown, Austin H., 2 lt. 4 inf.	Howard, John, 2 lt. 19 inf.
Bundy, Omar, 1 lt. 3 inf.	Hunter, Geo. K., capt. 3 cav.
Burr, Geo. W., 2 lt. 1 art.	Jamar, Mitchell F., 1 lt. 13 inf.
Carleton, Guy, 1 lt. 2 cav.	James, Wm. H. W., capt. 24 inf.
Castner, J. C., 2 lt. 4 inf.	Kellogg, Edgar R., maj. 8 inf.
Catlin, Edward H., 1 lt. 2 art.	Kerr, John B., capt. 6 cav.
Chase, Wilson, 2 lt. 20 inf.	Kimball, Fred. C., 2 lt. 5 inf.
Clark, Wm. F., 2 lt. 7 cav.	Koops, Carl, 2 lt. 13 inf.
Clem, John L., capt. qm. dept.	Lamoreux, Thos. B., 2 lt. 4 art.
Cloman, Sydney A., 2 lt. 1 inf.	Lee, Harry R., 2 lt. 11 inf.
Cochran, Melville A., col. 6 inf.	Ludington, Marshall I., lt.-col. qm. dept.
Collins, Chas. L., 1 lt. 11 inf.	Markley, Alfred C., capt. 24 inf.
Conrad, Casper H., capt. 15 inf.	Martin, Geo. W., 2 lt. 18 inf.
Conrad, Jos. S., col. 21 inf.	McAndrew, James W., 2 lt. 21 inf.
Corbin, Henry C., lt.-col. a. g. dept.	McCorkle, H. L., 2 lt. 25 inf.
Cree, John K., 2 lt. 3 art.	McGuire, Thos. H., 2 lt. 25 inf.
Crittenden, John J., 1 lt. 22 inf.	McGunnegle, Geo. K., capt. 15 inf.
Daniel, Lunsford, 2 lt. 6 cav.	McIndoe, J. F., 2d lt. engs.
Dashiell, Wm. R., 2 lt. 17 inf.	McIver, Geo. W., 1 lt. 7 inf.
Deems, Clarence, 1 lt. 4 art.	Merriam, Henry C., col. 7 inf.
Donaldson, Thos. Q. Jr., 2 lt. 7 cav.	Merrill, Abner H., capt. 1 art.
Drew, A. W., 2 lt. 12 inf.	Newcomer, Henry C., 1 lt. engs.
Duncan, Geo. B., 2 lt. 9 inf.	Nichols, Maury, 1 lt. 7 inf.
Edmunds, Frank H., capt. 1 inf.	Niskern, A. D., 2 lt. 20 inf.
Elliott, Stephen H., 2 lt. 5 cav.	Olmsted, Jerauld A., capt. 9 cav.
Emery, Jonas A., 1 lt. 11 inf.	Parker, Chas. F., 2 lt. 2 art.
Forsyth, Wm. W., 1 lt. 6 cav.	Parmerter, Almon L., 2 lt. 21 inf.
Frier, James H., 2 lt. 17 inf.	

Penney, Chas. G., capt. 6 inf.
 Perry, John A., 1 lt. 8 inf.
 Phister, Nat P., 1 lt. 1 inf.
 Pitcher, W. L., capt. 8 inf.
 Plummer, Edward H., 1 lt. 10 inf.
 Poore, Benjamin A., 2 lt. 12 inf.
 Ramsey, Frank de W., 2 lt. 9 inf.
 Reynolds, Alfred, capt. 20 inf.
 Rhodes, Charles D., 2 lt. 6 cav.
 Richards, Wm. V., capt. 16 inf.
 Roberts, Benjamin K., capt. 5 art.
 Roberts, Cyrus S., capt. 17 inf.
 Rockenbach, S. D., 2 lt. 10 cav.
 Rose, Robert W., 2 lt. 5 inf.
 Ruhlen, George, capt. qm. dept.
 Sargent, Fred. H., 2 lt. 7 inf.
 Sarson, Horace B., capt. 2 inf.
 Seay, Samuel, 2 lt. 21 inf.
 Sewell, J. S., 2 lt. engs.
 Shafter, Wm. R., col. 1 inf.
 Shuttleworth, E. A., 2 lt. 11 inf.
 Sigerfoos, Edward, 2 lt. 5 inf.
 Smith, Edmund D., 1 lt. 19 inf.
 Sorley, Lewis S., 2 lt. 16 inf.
 Stanton, Wm. S., maj. engs.
 Swaine, Wm. M., 2 lt. 22 inf.
 Swift, James A., 1 lt. 9 cav.
 Sydenham, Alvin H., 2 lt. 5 art.
 Taylor, Daniel M., capt. ord. dept.
 Taylor, John R. M., 2 lt. 7 inf.
 Todd, Albert, 1 lt. 1 art.
 Tompkins, Frank, 2 lt. 7 cav.
 Tutherly, Herbert E., capt. 1 cav.
 Van Deman, R. H., 2 lt. 21 inf.
 Watson, James W., 1 lt. 10 cav.
 Watts, Chas. H., capt. 5 cav.
 Wessels, Morris C., capt. 24 inf.
 Wilhelm, W. H., 2 lt. 10 inf.
 Wood, W. M., 2 lt. 12 inf.
 Wright, Walter K., 1 lt. 16 inf.
 Yates, A. W., 2 lt. 9 inf.

EX-OFFICERS, U. S. A.

Greene, G. S., lt. 3 art. Since bvt. m. g. vols.
 Rathbone, J. L., lt. 1 art. Since consul general to France.
 Tyler, Augustus C., lt. 4 cav.

U. S. NAVY.

Brainard, F. R., ensign.
 Hanford, Franklin, lt.-com'd'r.
 Whitehead, William, captain.

ASSOCIATE MEMBERS.

Adams, J. M., lt.-col. 2 regt. n. g., S. D.
 Appleton, Francis H., capt. 1 corps cadets, Mass., v. m.
 Ashley, O. D., ex-col. 37 regt. n. g., S. N. Y.
 Baker, Chas. S., lt. 27 N. Y. vols.
 Banes, Chas. H., bvt. lt.-col. U. S. Vols.
 Barbour, H. S., capt. 1 sep. co. (cav.) n. g., D. C.
 Barney, Wm. Grant, 30 sep. co. n. g., S. N. Y.
 Barry, Thos. F., col. 3 inf. n. g., Cal.
 Beebe, Chas. F., col. 1 inf. n. g., Oregon.
 Bend, W. B., col. 1 inf. n. g., S. Minn.
 Benét, Lawrence V., mil. eng. Hotchkiss Co.
 Biddle, Alex., col. 121 Pa. vols.
 Bischof, Wm., lt.-col. 2 regt. n. g., Neb.
 Bosbyshell, Oliver C., col. 2 regt. n. g., Pa.
 Bowman, Wendell P., col. 1 regt. n. g., Pa.
 Bratt, John P., col. 1 inf. n. g., Neb.
 Brett, Wm. H., Librarian Cleveland pub. lib.
 Briggs, Frank H., maj. a. i. g. Mass., v. m.
 Brooks, J. F., capt. 1 Ga. vol. regt.
 Brown, Glenn., lt. and adj. 4 regt. n. g., Iowa.
 Brown, Will E., col. Kentish Guards R. I.
 Brownell, F. C., mil. editor Boston *Herald*.
 Bruce, R. H., col. a. i. g. Texas v. g.
 Brush, Edmund C., col. 1 regt. light art. n. g., Ohio.
 Buchanan, Chas. J., maj. j. a. 3 brig. n. g., S. N. Y.

- Burdett, Chas. L., maj. eng. and sig. off. n. g., Conn.
- Burke, John U., 23 regt. n. g., S. N. Y.
- Burpee, Lucien F., maj. 2 regt. n. g., Conn.
- Bush, H. P., lt. col. 1 inf. n. g., Cal.
- Butt, McCoskry, com'y. 12 regt. n. g., S. N. Y.
- Cadle, Cornelius, lt. col. a. a. g. 17 corps.
- Chase, Arthur H., j. a. 1 brig. n. g., N. H.
- Chase, Wm. L., col. Mass. v. m.
- Cilley, Harry B., ex-maj. and i. r. p., n. g., N. H.
- Clark, Embury P., col. 2 regt. Mass. v. m.
- Clark, Louis V., col. 2 regt. Ala. s. t.
- Clark, Osman D., capt. 1 regt. n. g., Vt.
- Clarke, Haswell C., bvt. lt.-col. U. S. vols.
- Clarke, Wm. B., 1 lt. 1 corps cadets, Mass. v. m.
- Cockran, J. Watson, 1 lt. 7 regt. n. g., S. N. Y.
- Cogswell, C. H., maj. and surg. 3 regt. n. g., Iowa.
- Colby, Geo. H., ex-capt. 3 inf. n. g., N. H.
- Cole, Geo. M., capt. and adj. 3 regt. n. g., Conn.
- Colfax, Albert E., ex-capt. 22 regt. n. g., S. N. Y.
- Collins, Geo. R., capt. 3 inf. n. g., Mo.
- Compton, Wm. P., a. a. surg. U. S. Army.
- Conely, Edwin F., col. and a. d. c.; n. g. Mich.
- Coon, L. H., capt. 1 regt. n. g., Kan.
- Cox, J. D., m. g. U. S. vols.
- Curtis, N. Martin, bvt. m. g. U. S. vols.
- Cushman, Harry C., lt.-col., and a. a. g. 3 brig. n. g., N. Y. S.
- Cutler, A. D., lt.-col. and div. ins., n. g., Cal.
- Davidson, J. T., capt. and qm. 1 brig. n. g., Iowa.
- Davidson, Robert M., 1 lt. and adj. 17 inf. n. g., Ohio.
- Davis, Chas. G., maj. 1 Mass. cav.
- Davis, J. Horner, 2 lt. 1 regt. n. g., W. V.
- Dawson, Richard B., 23 regt. n. g., S. N. Y.
- Dearborn, E. B., ex 1 lt. 3 inf. n. g., N. H.
- Dimond, W. H., maj.-gen. n. g., Cal.
- Donnelly, Richd. A., qm. gen. n. g., N. J.
- Dows, W. G.
- Decker, W. M., 1 lt. r. qm., 1 inf. n. g., Neb.
- Eddy, Walter E., 2 lt. 1 regt. light art. n. g., Ohio.
- Edmands, Thos. F., bvt. col. U. S. vols.
- Edson, P. O'M., maj. and surg. 17 Vt. vols.
- Ely, Wm., capt. machine gun batty. n. g. R. I.
- Emmens, Stephen H.
- Erhardt, Joel B., capt., 1 Vt. cav. vol.
- Florence, Florian C., capt. and ord. off. 1 brig. n. g., Mo.
- Ford, Wm. D., lt.-col., a. d. c. n. g., Kansas.
- Foster, C. E., col. (staff) n. g., Iowa.
- Fuller, Harry S., capt. 4 inf. n. g., Wis.
- Fuller, Levi K., capt. (bvt. col.) light batty. n. g., Vt.
- Garrard, Wm., lt. col. 3 bat., Ga. vols.
- Gilchrist, Jas. G., col. 3 regt. n. g., Ia.
- Goggin, Jas. M., capt. 3 regt. Texas v. g.
- Graham, Geo., capt. insp. s. a. p. 3 regt. n. g., Wis.
- Granger, Moses M., bvt. col., U. S. vols.
- Gray, Frank P., 1 lt. light batty. n. g., Ark.
- Greene, Geo., adj. gen. State of Iowa.
- Greene, G. James, capt. 10 batln. n. g. S. N. Y.

- Greene, Jacob L., bvt. lt.-col. U. S. vols.
 Greves, John C.
 Haines, J. C., col. 1 regt. n. g., Wash.
 Hardeinan, John L., capt. 2 reg. Ga. vols.
 Harrison, T. B., maj. 3 batln. n. g., D. C.
 Hartung, Albert H., 1 lt. and adj. 2 inf. n. g., Pa.
 Haven, George, col. 3 regt. n. g., Ct.
 Hayden, Jas. R., capt. 19 Ill. vols.
 Hewins, E. H., ex-col. and a. i. g. Mass. v. m.
 Hickox, Warren R., adj. 76 Ill. vols.
 Hoffman, Edward M., capt. 30 sep. co. n. g., S. N. Y.
 Holway, Orlando, capt. and adj. 3 inf. n. g. Wis.
 Hooper, Wm B., bvt. maj. U. S. vols.
 Howard, Geo. E., col. 1 regt. n. g., Kansas.
 Howard, Willard, lt.-col. 4 batln. inf. n. g., Md.
 Hudson, Thos. J., col. and chf. of art. n. g., Pa.
 Hunt, Alfred E., capt. bat. B. n. g., Pa.
 Huntington, Eugene, brig. gen. adj. gen., S. D.
 Hyde, Frederick W., capt. 13 sep. co. n. g., S. N. Y.
 Isham, A. B., 1 lt. 7 Mich. cav. vols.
 Johnson, Samuel A., maj. 2 corps cadets, Mass. v. m.
 Jones, H. O., capt. n. g., S. N. Y.
 Kenan, O. T., capt. 5 Ga. cav.
 Kennett, L. M.
 Kessler, Harry C., lt.-col. 1 regt. n. g., Montana.
 Kircheis, Julius E., capt. 3 inf., n. g., Wis.
 Koster, John A., lt.-col. 2 art. n. g., Cal.
 Landis, Henry D., capt. ind. light battery. (vols.)
 Lewis, Samuel N., 1 lt. 118 Pa. vols.
 Lillie, James.
 Lincoln, Jas. Rush, col. chf. of eng. n. g., Iowa.
 Lintner, W. H. H., ex-maj. a. i. g., n. g., S. N. Y.
 Livermore, Thos. L., col. 18 N. H. vols.
 Lloyd, Jas. H., capt. 21 sep. co. n. g., S. N. Y.
 Lorish, A. J., lt. 1 N. Y. Dragoons.
 Love, Wm. H., col. a. a. qm. gen. n. g., Md.
 Lowe, R. G., maj. and a. a. gen. Texas v. g.
 Mabry, W. H., brig. gen., adj. gen. State of Texas.
 Macpherson, Ernest, col. j. a. gen. Ky. s. g.
 Mazet, R., 2 lt. 7 regt. n. g., S. N. Y.
 McKee, W. J., col. 2 inf. Ind. Legion.
 McKibbin, Chambers, ins. gen. n. g. Pa.
 Metcalf, Wilder S., capt. 1 regt. n. g., Kansas.
 Metcalf, Willis, capt. bat. A, 1 art. n. g., Kansas.
 Miller, J. A., capt. 3 inf. n. g., Ohio.
 Morley, B. F., lt.-col. n. g., Pa.
 Morse, Chas. C., 2 lt. 5 inf., n. g., Ohio.
 Moses, Wm. E., capt. 2 regt. n. g., Conn.
 Mott, M. F., col. and j. a. gen. Texas, v. g.
 Mravlag, Victor, maj. and surg. 3 regt. n. g., N. J.
 Murdock, Chas. M., capt. bat. A, n. g., Neb.
 Nelson, Chas. E., maj. and i. r. p. 1 brig., n. g., Vt.
 Niedman, W. F. de., maj. and surg. 1 regt. n. g., Kansas.
 O'Brien, R. G., brig. gen. and adj. gen. State of Wash.
 O'Grady, Wm. L. D., capt. 88 N. Y. vols.
 Olcott, Dudley, capt. 25 N. Y. vols.
 Openheimer, L. M., brig. gen. Texas v. g.

- Parker, H. W., maj. 3 regt. n. g., Iowa
 Pearson, R. I., 1 lt. bat. B, n. g., Mo.
 Perry, Frank I., 23 regt. n. g., S. N. Y.
 Pocock, Edgar J., col. 17 inf. n. g., Ohio.
 Porter, J. Biddle, lt.-col. 2 regt. n. g., Pa.
 Potter, G. Herbert, 23 regt. n. g., S. N. Y.
 Prime, John R., maj. and a. i. g., 2 brig. n. g., Iowa.
 Reagles, James, surg. 62 N. Y. vols.
 Reilly, Peter, lt.-col. 1 regt. Ga. vols.
 Reynolds, John A., bvt. col. U. S. vols.
 Richardson, Wm. L., surg. 1 corps cadets, Mass. v. m.
 Righter, Wm. S., maj. and a. d. c., n. g., N. J.
 Roberts, J. N., col. and adj. gen. State of Kansas.
 Rolfe, Robert H., ex-capt. 3 inf. n. g., N. H.
 Rollins, Frank W., lt.-col. and a. a. g. 1 brig. n. g., N. H.
 Ruddick, Wm. H., 1 lt., bat. A, light art. Mass. v. m.
 Scott, Wm. Forse.
 Sewell, W. J., bvt. maj. gen. U. S. vols.
 Sillman, Robert H., lt.-col. a. i. g. 1 brig. Mich. s. t.
 Smith, Ed. H., capt. 1 regt. n. g., Iowa.
 Smith, U. S. Grant, com. cadets, Trinity Hall.
 Smith, Wm. B., col. 3 regt. n. g., Pa.
 Smyth, R. P., col. 2 inf. Texas v. g.
 Snyder, Edward H., lt.-col. 3 batln. n. g. N. J.
 Spencer, Bird W., brig.-gen. ins. gen. r. p., n. g. N. J.
 Stryker, Wm. S., bvt. maj.-gen., adj.-gen., State of N. J.
 Swalm, Albert W., lt.-col. 3 regt. n. g. Iowa.
 Terry, Adrian, bvt. col. U. S. Vols.
 Thomas, Addison, col. Newport Art'y, R. I.
 Thompson, Thomas^o, capt. 3 regt. n. g. Conn.
 Thyng, Culver G., capt. 43 sep. co. n. g. S. N. Y.
 Ticknor, Thos. B., 1 lt. 1 corps cadets Mass. v. m.
 Tilden, Chas. L., capt. 1 inf. n. g. Cal.
 Toffey, John J., ex-lt.-col. 4 regt. n. g. N. J.
 Tree, Lambert, Judge.
 Truesdell, Samuel, bvt. lt.-col. U. S. Vols.
 Van Slyck, Cyrus M., col. United Train of Art., n. g. R. I.
 Varney, Geo., ex-col. 2 Maine V. M.
 Wadsworth, J. W., capt. and a. d. c. U. S. Vols.
 Watson, Thos. L., brig.-gen. n. g. Conn.
 Wells, Wm., bvt. maj.-gen. (cavalry)
 West, Geo. W., bvt. brig.-gen. U. S. vols.
 Wilcox, J. C., maj. 5 Iowa cav. vols.
 Wilson, Robt. P., capt. and a. a. g. U. S. Vols.
 Wolford, C. A., lt. n. g. Wis.
 Woodward, C. Meredyth, lt.-col. and surg. gen. Mich. s. t.
 Wyeth, F. H.
 Young, Chas. L., brig.-gen., qm. gen. n. g. Ohio.
 Young, W. H., capt. 1 regt. n. g. Kansas.
- Omitted from the list issued in July, 1891.*
- MEMBERS.
- McKinstry, C. H., 2 lt. engs.
 Wheeler, Fred., capt. 4 cav.
 Bourke, J. C., ex-lt. 5 art.
 Byrne, Edward, ex-cap. 10 cav.
 Griffin, Eugene, ex-capt. engs.
- ASSOCIATE MEMBERS.
- Brown, Emily, Miss.
 Cable, W. A., lt. 2 batt'y n. g. S. N. Y.
 Kerbey, J. Orton, bvt. capt. U. S. Vols.



Prize Essay—1892.

I.—The following Resolution of Council is published for the information of all concerned :

Resolved, That a Prize of a Gold Medal of suitable value, together with a Certificate of Life Membership, be offered annually by THE MILITARY SERVICE INSTITUTION OF THE UNITED STATES for the best essay on a military topic of current interest ; the subject to be selected by the Executive Council and the Prize awarded under the following conditions :

1. Competition to be open to all persons eligible to membership.*
2. Each competitor shall send three copies of his Essay in a sealed envelope to the Secretary on or before October 1, 1892. The Essay must be strictly anonymous, but the author shall adopt some *nom de plume* and sign the same to the Essay, followed by a figure corresponding with the number of pages of MS. ; a sealed envelope bearing the *nom de plume* on the outside, and enclosing full name and address, should accompany the Essay. This envelope to be opened in the presence of the Council after the decision of the Board of Award has been received.
3. The prize shall be awarded upon the recommendation of a Board consisting of three suitable persons chosen by the Executive Council, who will be requested to designate *the Essay deemed worthy of the prize*; and also in their order of merit those deserving of honorable mention.
4. The successful Essay shall be published in the Journal of the Institution and the Essays deemed worthy of honorable mention, shall be read before the Institution, or published, at the discretion of the Council.
5. Essays must not exceed twenty thousand words, or fifty pages of the size and style of the JOURNAL (exclusive of tables).

II.—The Subject selected by the Council at a meeting held Nov. 27, 1891, for the Prize Essay of 1892, is

"THE ARMY ORGANIZATION, BEST ADAPTED TO A
REPUBLICAN FORM OF GOVERNMENT, WHICH
WILL ENSURE AN EFFECTIVE FORCE."

III.—The gentlemen chosen by the Council to constitute the Board of Award for the year 1892, are :—

SENATOR CHARLES F. MANDERSON,
SENATOR REDFIELD PROCTOR,
GENERAL JOHN M. SCHOFIELD, U. S. A.

WM. L. HASKIN,
Secretary.

GOVERNOR'S ISLAND,
November 25, 1891.

* "All officers of the Army and Professors at the Military Academy shall be entitled to membership, *without ballot*, upon payment of the entrance fee. Ex-officers of the Regular Army of good standing and honorable record shall be eligible to full membership of the Institution *by ballot* of the Executive Council.

"Officers of the United States Navy or Marine Corps shall be entitled to membership of the Institution *without ballot*, upon payment of the entrance fee, but shall not be entitled to vote, nor be eligible to office.

"All persons not mentioned in the preceding sections, of honorable record and good standing, shall be eligible to Associate Membership *by a confirmative vote* of two-thirds of the members of the Executive Council present at any meeting. Associate Members shall be entitled to all the benefits of the Institution, including a share in its public discussions, but no Associate Member shall be entitled to vote or be eligible to office."

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Announcements.

I.

AT a meeting of the Executive Council, M. S. I., held at Governor's Island, N. Y., on the 13th day of November, 1891, the following resolution was adopted:

"That the Secretary of the Military Service Institution, when notified by the Treasurer that a member is two years in arrears with his dues, shall in place of sending him subsequent copies of the JOURNAL, send a letter of reminder, enclosing a copy of Section 6, Article 4, of the Constitution."

At the same meeting, the report of a committee which had been appointed to formulate a proposed amendment to the Constitution was received. It is as follows:—The Committee recommends the following as an addition to Section 6, Article 4, of the Constitution:

"When any member shall have been dismissed from the Army, Navy, or Marine Corps, by order of the President, or the sentence of a court-martial, or shall have been convicted by a civil court of a felony, his membership shall be forfeited and his name dropped from the rolls of the Institution."

The report was adopted by the Council and the Secretary of the M. S. I. was directed to call a general meeting of the Institution to take action upon it.

II.

A general meeting of the Military Service Institution is called for Friday, March 11, 1892, at 3 o'clock P. M., at Governor's Island, N. Y., to consider and vote upon the adoption of the proposed amendment to the Constitution cited above.

Members who cannot attend are earnestly requested to send their proxies to the Secretary of the Institution, or to some member of the Council.

III.

At a meeting of the Executive Council of the M. S. I., held on the 27th day of November, 1891, the several reports of the members of the Board of Award on the Prize Essay for 1891 were read, and it was found that the essay signed "Alma" was decided to be entitled to the prize, and the essays signed "Fantassin" and "Gabion" to honorable mention, in the order named.

Upon opening the accompanying envelopes the Prize Essayist was found to be 1st Lieut. Henry A. Reed, 2d U. S. Artillery, who thereupon became entitled to the prize medal of the Institution, together with a certificate of life membership.

The essay signed "Fantassin," by Captain Jas. S. Petit, 1st U. S. Infantry, receives first honorable mention; and the essay signed "Gabion," by 1st Lieut. Rowland G. Hill, 20th U. S. Infantry, receives second honorable mention.

The Military Service Institution.

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(1) "All Officers of the Army and Professors of the Military Academy shall be entitled to Membership *without ballot* upon payment of the Entrance Fee."

(2) "Ex-Officers of the Regular Army, in good standing and honorable record, shall be eligible to full Membership of the Institution, *by ballot* of the Executive Council."

(3) "Officers of the U. S. Navy and Marine Corps shall be entitled to Membership of the Institution, *without ballot*, upon payment of the Entrance Fee, but shall not be entitled to vote nor be eligible to office."

(4) "All persons not mentioned in the preceding sections of honorable record and good standing, shall be eligible to *Associate Membership* by a *confirmative vote of two-thirds* of the members of the Executive Council present at any meeting. Associate Members shall be entitled to all the benefits of the Institution, including a share in its public discussions; but no Associate Member shall be entitled to vote or be eligible to office."

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NOTE.—Checks, Money Orders, or Registered Letters should be drawn to order of, or addressed to, "The Military Service Institution," Governor's Island, New York Harbor. Changes of address should be reported promptly.





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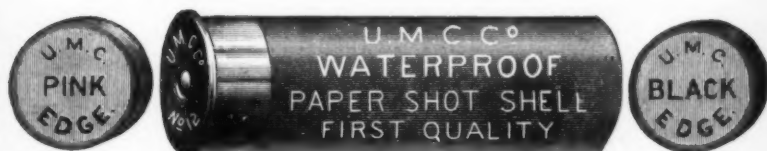
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Historical Sketches of the Army.

THE following named officers have volunteered, or have been designated to prepare Historical Sketches of their Corps or Regiments for publication in this JOURNAL.

- *Adjt. General's Dept.....GEN. J. B. FRY.
- Quartermaster's Dept.....GEN. S. B. HOLABIRD.
- Subsistence Dept.....GEN. J. W. BARRIGER.
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- *Signal Corps.....LIEUT. WM. A. GLASSFORD.
- 1st Cavalry.LIEUT. R. P. P. WAINWRIGHT.
- 2d Cavalry.....MAJOR A. E. BATES and CAPT. E. J. McCLEARNAND.
- 3d Cavalry.... ..LIEUT. THOS. B. DUGAN.
- *5th Cavalry.....LIEUT. EBEN SWIFT.
- 6th Cavalry.....CAPT. WM. H. CARTER.
- *8th Cavalry.....CAPT. C. M. O'CONNOR.
- *10th Cavalry.....LIEUT. JOHN BIGELOW, JR.
- 1st Artillery..... ..COLONEL L. L. LANGDON.
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- *4th Artillery.....LIEUT. A. B. DYER.
- 2d Infantry.....GEN. FRANK WHEATON.
- 3d Infantry..... ..CAPT. WM. GERLACH.
- 4th Infantry.....LIEUT. JAS. A. LEYDEN.
- 6th Infantry.LIEUT. CHAS. BYRNE.
- 7th Infantry.LIEUT. A. B. JOHNSON.
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- 9th Infantry.....LIEUT. E. B. ROBERTSON.
- 10th Infantry.....LIEUT. S. Y. SEYBURN.
- *11th Infantry..... ..MAJOR J. H. PATTERSON and CAPT. R. C. J. IRVINE.
- 12th Infantry.....LIEUT. CHAS. W. ABBOT, JR.
- 13th Infantry.... ..LIEUT. M. J. O'BRIEN.
- *14th Infantry.....COLONEL T. M. ANDERSON.

* Published in JOURNAL.

- 15th Infantry*.....LIEUT. G. K. MCGUNNEGLE and CAPT. G. A. CORNISH.
16th Infantry.....CAPT. WM. V. RICHARDS.
17th Infantry.....CAPT. GEORGE RUHLEN, A. Q. M.
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23d Infantry.....LIEUT. C. H. HEYL.
24th Infantry.....LIEUT. H. W. HOVEY.
**25th Infantry*.....LIEUT. GEORGE ANDREWS.

*Published in JOURNAL.

TENTH REGIMENT OF CAVALRY.

BY LIEUTENANT JOHN BIGELOW, JR., U. S. A.,

R. Q. M. TENTH CAVALRY.

SECTION 3 of an "Act to increase and fix the military peace establishment of the United States," approved on the 28th day of July, 1866, provides "That to the six regiments of cavalry now in service, there shall be added four regiments, two which shall be composed of colored men. * * *" The six regiments referred to as already in service were composed of white men.

The colored regiments were to be organized on the general plan of the white regiments, modified in a few particulars. They were each to have a regimental chaplain whose duty should include the instruction of enlisted men in the common English branches. Up to that time all chaplains had been appointed not in regiments but in the Army. The colored regiments were also given two veterinary surgeons each, whereas the white regiments had but one.

Another enactment which more or less affected the composition of these additional cavalry regiments, both white and colored, and which is deemed of peculiar interest, was the following:

"That no person shall be commissioned in any of the regiments authorized by this act until he shall have passed a satisfactory examination before a board to be composed of officers of that arm of the service in which the applicant is to serve, to be convened under the direction of the Secretary of War, which shall inquire into the services rendered during the War, capacity and qualifications of the applicant; and every such appointment when made, shall be without regard to previous rank, but with sole regard to qualifications and meritorious services."

The six white regiments already in the service were numbered consecutively from 1 to 6; the two new white regiments were numbered 7 and 8; the two colored regiments 9 and 10. It was as the 10th regiment of cavalry that the regiment now bearing that designation came into the service and made for itself the record which is the subject of this sketch.

General orders No. 92, A. G. O., dated November 23, but expressly of effect from September 21, announces the numerical designation, the field officers (so far as they have accepted) and the stations or headquarters of the new regiments of cavalry, also of certain new regiments of infantry forming under the same act.

Congress having created the 10th Cavalry in law, the first step towards its creation in fact was taken, it seems, by Lieutenant-General Sherman, commanding the Military Division of the Mississippi, in an order from his headquarters dated St. Louis, Missouri, August 9, 1866, which read as follows:

G. O. No. 6.

I. Commanders of military departments within this division in which colored troops are serving, will proceed at once to enlist men for two regiments of colored regulars, under the Act of Congress approved July 28, 1866, entitled "An Act to increase and fix the military peace establishment of the United States;" one of cavalry, to be entitled the 10th Regiment United States Cavalry, and one of infantry to be entitled the 38th Regiment United States Infantry.

II. Fort Leavenworth, Kansas, is hereby named as the headquarters and rendezvous of the 10th Cavalry, and Jefferson Barracks, Missouri, the headquarters and rendezvous of the 38th Infantry.

III. Commanding-generals of the Departments of the Missouri, Arkansas, and Platte, will detail one or more officers of the Regular Army, who will proceed to canvass the regiments of colored troops now serving in their respective departments, and enlist men for the new regiments above named, the cavalry for five years and the infantry for three years. The men so enlisted will be discharged from their present obligation and grouped into companies under officers to be selected by the colonels or regimental commanders hereafter to be appointed, but will be retained for the present at or near their present station. The number of privates allowed to a company is sixty-four. The men of existing colored regiments not willing to enlist in the new organizations will, for the present, be consolidated into companies under the direction of their immediate commanders, and held to service until the new army is sufficiently organized to replace them.

IV. The field officers of these regiments will, on arrival at these headquarters, proceed to the posts herein named and organize their new regiments according to law and regulations, but will not withdraw the new companies from their present stations without consent of department commanders, or orders from these headquarters.

V. Blanks will at once be sent from these headquarters, to which all reports will be made until the regular field officers are announced and recruitment organized under them. By order, etc.

The first regimental return was rendered on the 30th of September, 1866. It showed the aggregate strength of the regiment, present and absent, to consist of two officers,—Colonel Benjamin H. Grierson, and Lieutenant-Colonel Charles C. Walcutt,—and gave the number of recruits required as 1092. Colonel Grierson was reported present with the regiment, and Colonel Walcutt absent on regimental recruiting service.

The first commander of the 10th Cavalry is doubtless known personally as well as by reputation to most of the readers of this sketch. His raid through Mississippi in 1863 is the historic operation on which his reputation chiefly rests. It has placed him among the foremost cavalry leaders of the War, and seems destined, as it becomes better known and more justly appreciated, to add honor and distinction to his name. Lieutenant-Colonel Walcutt never joined the regiment, and resigned shortly after his appointment. The recruiting for the regiment was in the main regimental, that is, by officers of the regiment detailed to recruit for it. At the end of the year 1866, the 10th Cavalry consisted of two field officers, one company officer, and 64 unassigned recruits. It was still without a staff or a single organized company. For seven months of the new year the headquarters of the regiment remained at Fort Leavenworth. The work of filling up the regiment went on but continued to make slow progress. This was due in the main to

two causes,—the want of clerical assistance at recruiting stations, and the high standard fixed for the recruits by the regimental commander. Recruiting officers were not allowed to hire clerks and had extreme difficulty in securing any among their recruits or the members of their recruiting parties. With a view to securing an intelligent set of men for the ranks the colonel had Captain Louis H. Carpenter, who was recruiting at Louisville, Kentucky, ordered to Philadelphia, Pa., to open a recruiting station there. Writing to Captain Carpenter, the colonel says, after referring to the captain's knowledge of Philadelphia: "I requested you to be sent there to recruit colored men sufficiently educated to fill the positions of non-commissioned officers, clerks and mechanics in the regiment. You will use the greatest care in your selection of recruits. Although sent to recruit men for the positions specified above, you will also enlist all superior men you can who will do credit to the regiment."

During its last month at Fort Leavenworth the regiment lost heavily from disease, caused in the main by a cholera epidemic. From a death-rate which did not average one a month for the preceding ten months, the loss by death during the month of July, 1867, rose to 23. On the 6th of August, 1867, the headquarters of the regiment left Fort Leavenworth for Fort Riley, Kansas, where they were established on the 7th.

Let us take a general look at the regiment as it existed just prior to this change. We find the field and staff still incomplete, being composed as follows: Colonel, B. H. Grierson; Lieutenant-Colonel, J. W. Davidson; Majors, J. W. Forsyth and M. H. Kidd; Chaplain, W. M. Grimes; Adjutant, H. E. Alvord.

The regiment now comprises eight troops. Their designation, date of organization, original composition and color of horses are as below:

Troop A.—Color, bay. Organized February 18, 1867. Captain Nicholas Nolan; Lieutenants G. W. Graham and G. F. Raulston.

Troop B.—Color, bay. Organized April 1, 1867. Captain J. B. Vande Wiele; Lieutenants J. D. Myrick and J. W. Myers.

Troop C.—Color, bay. Organized May 15, 1867. Captain Edward Byrne; Lieutenants T. C. Lebo and T. J. Spencer.

Troop D.—Color, bay. Organized June 1, 1867. Captain J. W. Walsh; Lieutenants Robert Gray and R. H. Pratt.

Troop E.—Color, bay. Organized June 15, 1867. Captain G. T. Robinson; Lieutenant J. T. Morrison.

Troop F.—Color, gray. Organized June 21, 1867. Captain G. A. Armes; Lieutenants P. L. Lee and J. A. Bodamer.

Troop G.—Color, bay. Organized July 5, 1867. Captain H. T. Davis; Lieutenants W. B. Kennedy and M. J. Amick.

Troop H.—Color, black. Organized July 21, 1867. Captain L. H. Carpenter; Lieutenants T. J. Spencer and L. H. Orleman.

These troops are posted at Fort Hays, Fort Harker, and other points along the Smokey River, Kansas, on the line of the Kansas Pacific Railroad, then in course of construction. They had been put in the field for the protection of the railroad as fast as they were organized. The strength of the regiment, present and absent, amounts to 25 officers and 702 enlisted men.

The first engagement in which any part of the regiment participated occurred a few days before the regimental headquarters left Fort Leavenworth. Troop I, under Captain Armes, numbering 34 men and two officers, fought a party of 300 Indians near Saline River, 40 miles northeast of Fort Hays. The engagement lasted six hours and resulted in the troops being forced to retreat with the loss of Sergeant W. Christy, killed, and Captain Armes, wounded. On the twenty-first of the same month Captain Armes had another fight, the second on record in the regiment. Forty men of his troop, together with 90 men of the 18th Kansas Volunteers, engaged about 500 Indians northeast of Fort Hays. The losses in this fight were one soldier killed and scalped, and 13 wounded; fifteen men of the volunteers and two guides wounded, twelve horses killed and three wounded.

Troops I, K, L and M, were organized from the new headquarters at Fort Riley as here indicated :

Troop I.—Color, bay. Organized August 15, 1867. Captain G. W. Graham; Lieutenant Silas Pepoon.

Troop K.—Color, bay. Organized September 1, 1867. Captain C. G. Cox; Lieutenants R. G. Smither and B. F. Bell.

Troop L.—Color, sorrel. Organized September 21, 1867. Captain R. Gray; Lieutenant C. E. Nordstrom.

Troop M.—Color, mixed.* Organized October 15, 1867. Captain H. E. Alvord; Lieutenants P. L. Lee and W. R. Harmon.

In September, 1867, the field officers were increased in number to their full complement by the appointment of Major J. E. Yard. In the same month the position of regimental quartermaster was taken by Lieutenant W. H. Beck. Thus were filled the last of the original vacancies in the field and staff.

The headquarters remained at Fort Riley until April 17, 1868. The troops were about evenly distributed between Kansas and Indian Territory and were employed in the perfection of their drill and discipline, and in the protection of the Union Pacific Railroad and exposed settlements. The only engagement of this period took place about 45 miles west of Fort Hays. Sergeant Davis and nine men of Troop G were attacked by fifty or sixty Cheyennes. They drove the Indians off in confusion losing one private wounded.

From Fort Riley the headquarters of the regiment went to Fort Gibson, I. T. At this time General Sheridan was in the field directing military operations. The Indians had brought on a war by their characteristic restlessness and deviltry. They were attached to agencies to which they came in from time to time for supplies, but they were not confined to any reservations. General Sheridan determined to put them and keep them on reservations, or, if that could not be done, to show them that winter weather would not give them either rest or impunity. The consequence was the winter campaign of 1867-68, which resulted in the destruction of Black Kettle's band of Cheyennes, the worst lot of Indians in the territory. The

* Troop M got all the horses that would not match any other troop and was called the "calico" troop.

10th Cavalry was in the field and came in for a good share of hard marching and fighting.

On the 15th of September, 1868, Troop I, Captain Graham, was attacked by about 100 Indians. It fought until dark, losing ten horses killed and captured, and killing seven Indians.

On the 17th of this month Lieut.-Colonel G. A. Forsyth, A. D. C. to General Sheridan, with a party of white scouts, was attacked and "corralled" by a force of about 700 Indians on an island in the Republican River. Two of Forsyth's scouts stole through the Indian lines and brought word of the perilous situation of the command to Fort Wallace. Parties were soon on the way to its relief. First and last the following troops were started towards it from different points. Captain Bankhead with about 100 men of the 5th Infantry, Captain Carpenter with Troop H and Captain Baldwin with Troop I, of the 10th Cavalry, and two troops of the 2d Cavalry under Major Brisbin.

Captain Carpenter's troop was the first of these commands to arrive upon the scene. It found Forsyth's command out of rations, living on horse-flesh without salt or pepper. All its officers had been killed or wounded. Every horse and mule, too, had been killed. Forsyth, who had been twice wounded, was lying in a square hole scooped out in the sand, within a few feet of a line of dead horses which half encircled the hole and impregnated the air with a terrible stench. Captain Carpenter immediately pitched a number of tents in a suitable place near by, had the wounded men carried to them, and the rest removed to a more salubrious air. Twenty-six hours later Captain Bankhead arrived bringing with him the two troops of the 2d Cavalry.

On the 14th of the following month, two weeks after he had returned to Fort Wallace with the wounded of Forsyth's command, Captain Carpenter was ordered to take his own troop and I Troop of the 10th Cavalry and escort Major Carr, of the 5th Cavalry, to his command, supposed to be on Beaver Creek. On the march he was attacked by a force of about 500 Indians. After proceeding, regardless of the enemy's firing and yelling, far enough to gain a suitable position, he halted his command, had the wagons corralled close together and rushed his men inside at a gallop. He had them dismount, tie their horses to the wagons, and form on the outside around the corral. Then followed a volley of Spencers which drove the Indians back as though they were thrown from a cannon. A number of warriors, showing more bravery than the others, undertook to stand their ground. Nearly all of these, together with their ponies, were killed. Three dead warriors lay within fifty yards of the wagons. The Indians were so demoralized by these results that they did not renew the attack and the troops accomplished their march without further molestation. They were back at Fort Wallace on the 21st, having travelled 230 miles in about seven days. For their gallantry in the fight, which took place on Beaver Creek, the officers and men were thanked by General Sheridan in a general field order, and Captain Carpenter was breveted Colonel.

Regimental headquarters remained at Fort Gibson until March 31, 1869, when they were moved to Camp Wichita, I. T., where they arrived on the

12th of April. Camp Wichita, an old Indian village, was selected by General Sheridan as a site for a military post and the 10th Cavalry was ordered there to establish and build it. Some time in the following month of August the post was given the name of Fort Sill, by which name it will be designated in these pages.

The military duty of the regiment was now that of an army of occupation, to hold the country from which the Indians had been expelled and to keep the Indians within the bounds assigned them. It gave rise to frequent scouting for trespassers and marauders and occasional reconnoissance and demonstration in considerable force. More than once the garrison of Fort Sill had to apprehend an attack upon the post.

On the 11th of June Camp Supply was alarmed by a party of Comanches charging through it, shooting and yelling, with the object of stampeding the horses on the picket line, and they succeeded in stampeding a few. These were pursued by Troops A, F, H, I and K, 10th Cavalry, and Companies B, E and F, 3d Infantry, commanded by Lieut.-Colonel Nelson, 3d Infantry. The Indians turned on their pursuers and attacked them, wounding three soldiers and killing two horses. Six Indians were killed and ten wounded.

During the 22d and 23d of August the Wichita Agency was subjected to a fierce attack by the Kiowa and Nacanee Indians. The Agency was defended by Troops C, E, H and L, 10th Cavalry, commanded by Lieut.-Colonel Davidson. The main object of the attack, as expressed in the vigorous language of the hostiles, was to "wipe out" the buildings and settlement. Attempts were made to do so by setting fire to the prairie at different points, but the tireless and well-directed efforts of the defenders succeeded in extinguishing the flames and saving the buildings. Repeated assaults were made by the Indians in numbers ranging from 50 to 500, at different points of the line, all of which were repulsed with the infliction of heavy losses and great disorder upon the assailants. The decisive feature of the engagement was a charge made by Captain Carpenter's troop. His men routed a body of over 150 warriors, who were about to take up a commanding position in rear of the troops. The loss of the troops was only four men wounded. That of the Indians was quite large, but owing to their well-known custom of carrying off their dead and wounded could not be definitely ascertained.

From Fort Sill the regimental headquarters moved back to Fort Gibson. They left Fort Sill on the 5th of June, 1872. During the three years and two months of their stay at that station a majority of the regiment—for a time there were eleven troops—was constantly at headquarters. The monthly rate of desertion fell from 7 to 3; the rate of discharge by court-martial from 2.5 to 1.5. In fact, the deportment of the regiment attested the advantage to discipline of large commands and varied and interesting occupation for the troops.

Among the stations other than Fort Sill, held by troops of the 10th Cavalry, were Forts Dodge, Gibson and Arbuckle, Camp Supply and Cheyenne Agency. Having remained at Fort Gibson until April 23, 1873, the regimental headquarters then returned to Fort Sill. In the meantime there had been a few skirmishes unattended by any casualties.

A movement of troops was now under way looking to a transfer of the regiment to the Department of Texas, and the end of April found Troops E, I and L at Fort Richardson, Texas; and Troops C, D and F en route, the two former for Fort Griffin, the latter for Fort Concho, Texas. The headquarters were reestablished at Fort Sill on the 4th of May, 1873, and remained there until the 27th of March, 1875. During this time the regiment continued serving partly in Texas and partly in the Indian Territory. The troops that were serving in the Indian Territory took part in the campaign of 1874-75 against the Kiowas and Comanches. This campaign was but a continuation of the campaign of 1867-68, and, like the latter, was directed by General Sheridan. There were four columns in the field operating separately under the following commanders:

Lieut.-Colonel Neill, 6th Cavalry; Colonel N. A. Miles, 5th Infantry; Lieut.-Colonel Davidson, 10th Cavalry; Colonel R. S. Mackenzie, 4th Cavalry.

The first capture of the campaign was made by a portion of Davidson's column. On the 25th of October, 1874, Troops B and M, 10th Cavalry, and one company of the 11th Infantry, under command of Major Schofield, while in pursuit of Indians near Elk Creek, pressed them so hard that the whole band surrendered. They numbered 68 warriors, 276 squaws and children, and about 1500 ponies. These prisoners, and others taken subsequently, were put in camp at Fort Sill, the more dangerous bucks being closely confined. At the close of the campaign the ringleaders were sent to Fort Marion, Florida, under charge of Captain Pratt. This officer never returned to the regiment. He is now justly distinguished for his work as an educator of Indians, especially in the superintendence of the Carlisle Indian School.

On the 6th of April, 1875, Black Horse, one of the Cheyenne ringleaders who was billeted for Fort Marion, broke from his guard at Cheyenne Agency and ran towards the camp of his people near by. He was pursued by Captain Bennett, 5th Infantry, with the guard, who fired upon Black Horse and killed him. Several shots passed beyond him and wounded some people in the camp. After firing a volley of bullets and arrows at the guard, about one-half of the Cheyenne tribe abandoned their camp and fled to a group of sand-hills on the south side of the Canadian River opposite the Cheyenne Agency. They were followed by a company of the 5th Infantry, a troop of the 6th Cavalry, and Troops D and M of the 10th Cavalry, all under command of Lieut.-Colonel Neill, 6th Cavalry. Being well armed and well posted, the Indians held their ground until nightfall and then stole away. The troops took up the trail and followed it about ten days, at the end of which time it was covered up by rains. Troops from other posts were ordered to assist in the pursuit and eventually most of the fugitives gave themselves up. In the fight at the Agency the Indians lost eight killed. The 10th Cavalry lost 12 men wounded, one mortally.

When moved for the second time from Fort Sill the regimental headquarters were transferred to Fort Concho, Texas, where they were established on the 17th of April, 1875. The 1st of May found the troops of the regiment located in Texas and Indian Territory as follows:

Troops A, F, G, I and L, at Fort Concho; B and E at Fort Griffin; C and K at Fort McKavett; H at Fort Davis; D and M in the field at Buffalo Springs, I. T. During the month of May, troops D and M moved from the Indian Territory, the former to Fort Concho, the latter to Fort Stockton.

In the course of the next two years the disposition of the troops was modified so as to scatter the regiment over the length and breadth of Western Texas. Its headquarters, however, were destined to remain at Fort Concho for more than seven years. During this period the regiment continued with some variation its past experience in Indian fighting. Its campaigning consisted mainly in pursuing small bands of marauding Apaches. This carried the troops,—now across the border into the unknown territory of the "Gringo"-hating Mexicans,—now over the scorching wastes of the Staked Plains,—now up and down the rocky fastnesses of the Guadalupe Mountains and the bad lands bordering the upper Rio Grande.

The following are a few instances of this kind of service:

In July, 1876, Troops B, E and K crossed into Mexico as part of a column commanded by Lieut.-Colonel Shafter, 24th Infantry. A detachment of this command, made up of twenty picked men of Troop B under Lieutenant Evans, and twenty Seminole scouts, all under command of Lieutenant Bullis, 24th Infantry, made a march of 110 miles in twenty-five hours and thereby succeeded in surprising a camp of twenty-three lodges of hostile Lipans and Kickapoos near Saragossa, Mexico. They killed ten Indians and captured four, and also captured about 100 horses. They then made a bonfire of the camp material and with their prisoners and captured stock rejoined the main column as fast as their jaded horses would carry them.

On the 10th of July, 1877, Troop A left Fort Concho under command of Captain Nolan for a scout on the Staked Plains. The command got lost, and, as a consequence, Captain Nolan, Lieutenant Cooper, Sergeant Jackson and about ten privates were ninety-six hours without water. Four of the men died. Other parties were from twenty-four to thirty-eight hours without water. The command was found and brought back to Fort Concho by a party sent out from there to search for it.

In 1880 the regiment was engaged in what is known as the Victoria campaign, a series of operations direct against the Mescalero Apache chief Victoria, who, with his whole band, had escaped from the military authorities in New Mexico. On the 30th of July Colonel Grierson, with a party of only six men, was attacked by this band between Quitman and Eagle Springs. Lieutenant Finley with fifteen men of Troop G came up, engaged the Indians, and held them in check until the arrival of Captains Viele and Nolan with Troops C and A. In an engagement, which lasted four hours, seven Indians were killed and a number wounded. On the side of the troops one soldier was killed and Lieutenant Colladay wounded. The hostiles were driven off and pursued to the Rio Grande. In the course of the pursuit a running fight of at least fifteen miles was maintained near the Alamo by a detachment under Corporal Asa Weaver of Troop H. Private Tockes, Troop C, was killed. His horse went to bucking and then ran directly into the Indians. When last seen alive this devoted trooper had dropped his reins, drawn his carbine, and was firing to right and left. His

skeleton was found months afterwards. For his gallant conduct in this affair Corporal Weaver was promoted to a sergeant on the ground. The same day Captain Lebo, with Troop K, followed an Indian trail to the top of the Sierra Diabola, captured Victoria's supply camp of twenty-five head of cattle, and a large quantity of beef and other provisions on pack animals.

The decisive blow of the campaign was struck a few days later by Colonel Grierson. Being on the trail of Victoria, heading northward through the Carriso Mountains, Grierson switched off to his right, and, by a forced march of sixty-five miles, swung around the flank of the unsuspecting Apaches and struck them in front, forcing them southward across the frontier. Victoria never went raiding again on American soil. He was subsequently killed by the Mexican troops near Lake Guzman, Mexico.

In July, 1882, regimental headquarters were moved from Fort Concho to Fort Davis, where they remained until March 30, 1885. During this time the regiment saw little active field service.

In the spring of 1885 the regiment moved from the Department of Texas to the Department of Arizona, marching along the Southern Pacific Railroad. When the column took up its march from Fort Davis it comprised eleven troops and the band. At Camp Rice it was joined by Troop I, and from this point to Bowie Station, Arizona, the twelve troops continued together. They had never been together before and never have been since. At Bowie the troops separated to go to their several stations. The headquarters went to Fort Apache, where they arrived on the 20th of May.

The Geronimo campaign had just commenced, and on the 19th of May a battalion formed of Troops D, E, H and K, under Major Van Vliet, was sent out from Fort Grant in search of hostiles. They marched to Fort Bayard, N. M., and through the Mogollon Mountains, but saw nothing of them. The greater part of the regiment was in the field during the whole campaign. Several of the officers, anxious to be where there was most to be done, had themselves detached from their troops to do duty with Indian scouts at the front. Thus, Lieutenant Shipp was with Captain Crawford in Mexico when that officer was killed. Lieutenant Finley accompanied Captain Lawton in his long, hard chase of Geronimo, which led to his surrender. Lieutenant Clarke patrolled the Mexican border. The latter especially distinguished himself in an engagement which Troop K, under command of Captain Lebo, had with Geronimo's band in the Pineto Mountains in Mexico. His conduct on this occasion has recently won for him a medal of honor.

After Geronimo had surrendered to Captain Lawton, a remnant of his band under Chief Mangus, who was still defying the Government of the United States, was run down in handsome style by Troop H, under the command of Captain Cooper.

Such instances of distinguished service are the more creditable as the opportunities therefor were extremely rare. To the greater part of the regiment the Geronimo campaign was a dismal succession of inglorious days devoted to the guarding of water-holes, mountain passes, etc.

In 1887 part of the regiment was in the field in search of "the Kid," a former follower of Geronimo, who had never been caught, and has not been

yet. Lieutenant Carter P. Johnson especially distinguished himself by the skill, energy and perseverance with which he pursued this Indian.

On the 15th of April, 1890, the regiment lost the colonel who had commanded it from its organization by his promotion to a brigadier-general. The vacancy was filled by the promotion of Lieut.-Colonel J. K. Mizner, 8th Cavalry, who is the present chief of the regiment. Regimental headquarters were moved by Colonel Mizner to Fort Grant, where they now (1891) are.

TWENTY-FIFTH REGIMENT OF INFANTRY.

BY LIEUT. GEO. ANDREWS,

25TH U. S. INFANTRY.

THE Act of July 28, 1866, added to the nineteen regiments of infantry then in service, "Eight new regiments of ten companies each, four regiments of which shall be composed of colored men." Accordingly the 38th, 39th, 40th and 41st were so composed, while the 42d, 43d, 44th and 45th were designated Veteran Reserves. The eighteen regiments between the 19th and 38th were provided by erecting the second and third battalions of each of the three-battalion regiments (11th and 19th, inclusive) into separate regiments. The same Act contained the following provision, which has not since been modified: "The President may, by and with the advice and consent of the Senate, appoint a chaplain for each regiment of colored troops."

The Act of March 3, 1869, provided for the consolidation of the forty-five regiments into twenty-five, and also that "The enlisted men of two regiments of infantry shall be composed of colored men." General Orders issued from Army Headquarters in May, 1869, directed the "Twenty-fifth Infantry (colored), to be composed of the 39th and 40th Regiments," and ordered "The 39th, now in North Carolina, will be relieved as soon as possible and will proceed to New Orleans, there to be consolidated with the 40th, now in the Department of Louisiana. The field officers will be: Joseph A. Mower, colonel; Edward W. Hinks, lieutenant-colonel; Zenas R. Bliss, major."*

The 25th Infantry of 1866 conveyed its personnel to the 18th; probably its records and colors were returned to the War Department. Although

* The first regiment of this number and name was raised in Connecticut and organized under the Act approved June 26, 1812; it was discontinued by the Act approved March 3, 1815. The officers retained in service were transferred to other regiments May 17, and the rest discharged June 15, 1815, with three months' pay. From brevets conferred upon its officers it would appear that the regiment participated in the battles of Chrystler's Fields, Upper Canada, Nov 11, 1813; Chippewa Falls, U. C., July 5, 1814, and Niagara Falls (Lundy's Lane) U. C., July 25, 1814.

Under the provisions of the Act of July 28, 1866, the 2d Battalion of the 16th Infantry was constituted the 25th Regiment, which was merged in the 18th by the Act of March 3, 1869.

from a legal standpoint the 25th Infantry has had a continuous existence since 1866, it is evident that for all purposes of tradition, the present regiment sprang into existence in 1869, and has no connection with any regiment that has previously borne the number. The regiment is, therefore, the lineal descendant of the 39th and 40th Regiments.

By the end of April, 1869, the organization of the regiment had been completed and the special return shows a full complement of officers and 1045 men. Colonel (and Bvt. Major-General) Mower was commanding the Department of Louisiana with headquarters at New Orleans; Lieutenant-Colonel (and Bvt. Brigadier-General) Hinks commanded the regiment with headquarters, Companies D, G and K, at Jackson Barracks, La.; Major (and Bvt. Lieut.-Col.) Bliss with Companies E, F and I garrisoned Ship Island, Miss.; Company A was at Fort Pike, La.; Companies B and H at Fort Jackson, La.; Company C at Fort St. Philip, La. By the end of the year, 532 men had been discharged by expiration of service alone, and as little recruiting was done, the effective had fallen to about 500 men, from which it has not since varied materially.

General Mower died at New Orleans January 6, 1870, and was succeeded by Colonel (and Bvt. Major-General) J. J. Reynolds who was placed in command of the Department of Texas the following April, without having joined the regiment. In May, 1870, the regiment was on its way to that department, going by steamer to Indianola, Texas, thence marching to San Antonio. Colonel Bliss with Companies B, C and G arrived at the latter place on June 3 and encamped at San Pedro Springs where they were joined by the rest of the regiment, under General Hinks, on the 9th. The march to stations began June 22d. The main body took the Fort Clark road, while Companies C and H diverged on the road to Fort McKavett. At Rio Frio, Companies E and I marched for Fort Duncan, under Colonel Bliss. July found Headquarters, Companies D and F established at Fort Clark; Company K at Fort Stockton; Companies A and G at Fort Davis; Company B did not reach its distant station, Fort Quitman, until August.

In December, 1870, General Reynolds transferred to the 3d Cavalry and General Hinks retired from active service; they were succeeded by Colonel John D. Stevenson and Lieut.-Col. George L. Andrews; the latter becoming colonel of the regiment January 1, 1871, vice Stevenson resigned. Colonel Andrews joined the regiment at Fort Clark June 19, 1871. In May, 1872, the regiment marched to Western Texas and established its headquarters at Fort Davis. Company I, Captain Lawson commanding, participated in the engagement with Indians at Wichita Indian Agency, Ind. Ter., Aug. 22 and 23, 1873, having one man wounded. Company B, Captain Bentzoni commanding, was with General Mackenzie's expedition into Mexico in June 1878.

The history of the ten years' service in Texas is the record of a continuous series of building and repairing of military posts, roads and telegraph lines; of escort and guard duty of all descriptions; of marchings and counter-marchings from post to post, and of scouting for Indians which resulted in a few unimportant skirmishes.

In April, 1880, the regiment was ordered to the Department of Dakota,

exchanging with the 1st Infantry. Headquarters and four companies took station at Fort Randall, S. D., in June and remained there until the arrival of the 15th Infantry in November, 1882, when they were transferred to Fort Snelling, Minn., relieving the 7th Infantry. During this period four companies were stationed at Fort Meade, S. D., and two at Fort Hale, S. D. The latter post was abandoned in May, 1884, and the garrison transferred to Fort Sisseton, N. D.

In May, 1888, the regiment was transferred to Montana, exchanging stations with the 3rd Infantry. Headquarters and four companies were located at Fort Missoula, while four companies went to Fort Shaw and two to Fort Custer.

In September, 1890, companies I and K were skeletonized pursuant to orders from the War Department. Lieutenant-Colonel Van Horn, with companies C, E, F and H, arrived at Fort Keogh the last of November, 1890, and remained there in camp until February 5, 1891, when they returned to their stations, nothing further having been required of them during that short but eventful campaign against the hostile Sioux.

Of the original officers of the regiment there are now but six on the rolls, viz.: Captains John W. French, Charles Bentzoni (Bvt. Lieut.-Col.), and Gaines Lawson (Bvt. Lieut.-Col.), and 2d Lieutenants (now captains) David B. Wilson, Owen J. Sweet and Henry P. Ritzius. It may also be interesting to note that Colonel Andrews, who has been colonel of the regiment for over twenty years, is the only colonel who ever commanded it; that during its 22 years of existence, the whole regiment has been together but fourteen days, and that but one captain (Van Valzah) has attained his majority by regular promotion.

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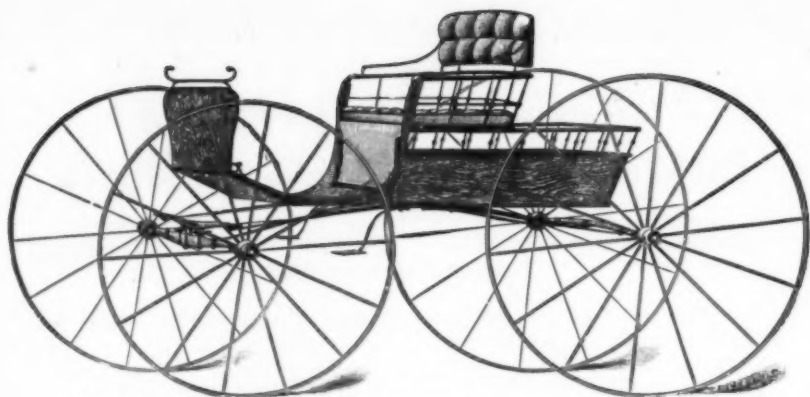
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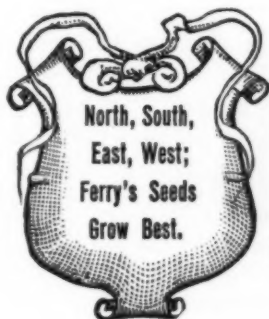
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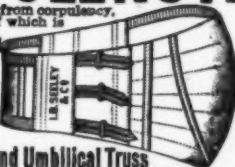
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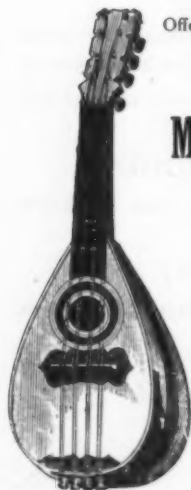
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